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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 14, NUMBER 9
MAY 1, 1981

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A semimonthly publication of the Office of Water Research and Technology,
U.S. Department of the Interior

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The Secretary of the Interior has determined that the publication of the periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1983.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

PREFACE

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. These documents cover water resources as treated in the life, physical, and social sciences and the related engineering and legal aspects of the characteristics, supply condition, conservation, control, use, or management of water resources. Each abstract includes a full bibliographic citation and a set of descriptors which are listed in the **Water Resources Thesaurus.** The abstract entries are classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the then Federal Council for Science and Technology.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several services of the Office of Water Research and Technology. The cumlative SWRA file from 1968 and monthly updates are available also in magnetic tape through lease from NTIS.

THE OFFICE OF WATER RESEARCH AND TECHNOLOGY DOES NOT PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Comments and suggestions concerning the contents and arrangement of this bulletin are welcome.

Office of Water Research and Technology
U.S. Department of the Interior
Washington, D.C. 20240

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Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

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Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

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SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

CONTROLLING THE RATE OF ACID LOSS FROM STRIP MINE SPOIL,
Science and Education Administration, University Park., PA. Northeast Watershed Research Center.
For primary bibliographic entry see Field 5B.
W81-01531

2C. Snow, Ice, and Frost

COMMENT ON 'EFFECTS OF CHANNEL ENLARGEMENT BY RIVER ICE PROCESSES ON BANKFULL DISCHARGE IN ALBERTA, CANADA' BY D. G. SMITH,
Kellerhals Engineering Services, Heriot Bay (British Columbia).
R. Kellerhals, and M. Church.
Water Resources Research, Vol 16, No 6, p 1131-1134, December, 1980. 2 Fig, 19 Ref.

Descriptors: *Ice breakup, *River flow, *Scour, Stream erosion, Flood recurrence interval, Alberta, *Canada, Ice jams, Streamflow, Channels, Banks, Erosion, Flood flow, Flood plains.

The author challenges Smith's (1979) explanation (channel scour due to ice jams and ice transport at breakup enlarges river channels) for the unusually long time observed for Albertan rivers to return to bankfull flow. Although the ice scour is not dismissed entirely, three other explanations are suggested: recent entrenchment of some major rivers' return periods may be shorter than Smith's indication, and small streams ice completely to the bottom, causing flooding upon breakup. (Cassar-FRC)
W81-01516

2D. Evaporation and Transpiration

NIGHTTIME, WET CANOPY EVAPORATION RATES AND THE WATER BALANCE OF AN EVERGREEN MIXED FOREST,
Forest Research Inst., Christchurch (New Zealand).
A. J. Pearce, L. K. Rowe, and J. B. Stewart.
Water Resources Research, Vol 16, No 5, p 955-959, October, 1980. 1 Fig, 15 Ref.

Descriptors: *Evaporation, *Interception, Diurnal, Hydrologic cycle, Energy transfer, Water balance, Canopy, Mathematical studies, Regression analysis, Rainfall, Transpiration, Radiation, Stemflow.

The nighttime evaporation rates from the wet canopy of an evergreen mixed forest were investigated to better understand the water balance and diurnal energy relationships. The study site, located in the northwest sector of South Island, New Zealand, averaged 2600 mm of rainfall per year, and 50% of this occurred at night. A regression of interception loss on gross rainfall for 35 storms occurring between 7 pm and 7 am LT showed that the average nighttime evaporation rate of water intercepted on the forest canopy was 0.37 mm/hour. The same rate was also calculated for both daytime and nighttime rainfall in 1975-1976. This similarity between daytime and nighttime evaporation rates suggested that evaporation from the wet canopy is driven by advected energy instead of radiation. A net interception loss of 81-84% of gross interception was calculated from the diurnal rainfall distribution and nighttime evaporation rate. This value was greater than the net losses measured in other investigations where losses at night were not considered separately but were estimated in conjunction with losses occurring during the day. Nighttime interception losses were about 30% of total evaporation, 40-50% of total gross interception, and 50-60% of the total net interception. (Geiger-FRC)
W81-01515

2E. Streamflow and Runoff

VULNERABILITY OF WATER SUPPLY SYSTEMS TO DROUGHTS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 6B.
W81-01493

FLUVIAL GEOLOGY AND ARCHAEOLOGY OF THE HOUSATONIC RIVER VALLEY IN NORTHWESTERN CONNECTICUT,
Wesleyan Univ., Middletown, CT. Dept. of Earth and Environmental Sciences.
For primary bibliographic entry see Field 2J.
W81-01496

COMMENT ON 'EFFECTS OF CHANNEL ENLARGEMENT BY RIVER ICE PROCESSES ON BANKFULL DISCHARGE IN ALBERTA, CANADA' BY D. G. SMITH,
Kellerhals Engineering Services, Heriot Bay (British Columbia).
For primary bibliographic entry see Field 2C.
W81-01516

COMMENT ON 'DRAINAGE NETWORK POWER' BY K. J. GREGORY, AND REPLY BY K. J. GREGORY,
Sheffield Univ. (England). Dept. of Geography.
A. D. Knighton.
Water Resources Research, Vol 16, No 6, p 1128-1129, December, 1980. 1 Tab, 6 Ref.

Descriptors: *Drainage, *Streamflow, Flow measurement, Hydrology, Channels, Potential flow, *Flow characteristics, Basins, Topography, Forecasting, Evaluation.

Gregory stated in a 1979 paper that flow characteristics in a drainage network can be estimated by using the index of estimated channel volume to total relief of the basin, and that this index expresses the potential energy available in the stream network of a drainage basin. This assertion is challenged because the structure of the network is ignored and only bankfull stage is considered. In addition, it is claimed that the parameters are not easily measured and that results would be a poor estimate of flow characteristics. Gregory replies to these criticisms with further clarifications and claims that although the proposed index is not perfect, it is an improvement on existing knowledge of the relation between channel length and channel capacity. (Cassar-FRC)
W81-01517

DISTRIBUTION-FREE METHODS FOR ESTIMATING FLOOD AND STREAMFLOW EXCEEDANCE PROBABILITIES BY CORRELATION,
Institute of Hydrology, Wallingford (England).
D. M. Cooper, and R. T. Clarke.
Water Resources Research, Vol 16, No 6, p 1121-1127, December, 1980. 3 Fig, 2 Tab, 8 Ref.

Descriptors: *Flood forecasting, *Streamflow forecasting, *Peak discharge, *Correlation analysis, Annual flood, River forecasting, Probability, Mathematical studies, Hydrologic data, Rainfall, Flood profiles, Flood plains, Flood frequency, Estimating, Planning, Thames River(UK).

A distribution-free method is proposed for inferring probabilistic properties of a variable y (such as an annual flood in a given year or total runoff from a basin in a year) from longer records of another variable x which is related to y. Examples of x variables are annual flood measured in a neighboring basin and total mean areal precipitation in the same period. Although this method is not applicable to estimating floods of very large return periods, such as for spillway design, it should be useful in estimating floods on a shorter return period, for example, culvert design or planning land use in flood plains. As an illustration, 40 years of January streamflow and 80 years of precipitation records for the River Thames at Eddington produced close to the same estimates as those obtained from 80 years' records of both streamflow and precipitation. (Cassar-FRC)
W81-01519

SEASONAL RUNOFF VOLUMES CONDITIONED ON FORECASTED TOTAL RUNOFF VOLUME,
Hokkaido Univ., Sapporo (Japan). Dept. of Civil Engineering.
K. Hoshi, and S. J. Burges.
Water Resources Research, Vol 16, No 6, p 1079-1084, December, 1980. 2 Fig, 4 Tab, 19 Ref.

Descriptors: *Snowmelt, *Runoff forecasting, Model studies, Forecasting, Streamflow forecasting, Snowpacks, Mathematical models, *Cascade Mountains(WA), Cedar River(WA), Washington, Estimating, Melt water, Melting, Glaciohydrology.

Total snowmelt runoff from a snowpack may be forecast accurately for a 6 month period. This paper describes a relatively simple and complete mathematical model which was used to divide the total forecast into monthly stream flow estimates (March - August) of the Cedar River, Washington, located in the Cascade Range. The unconditional distribution of total runoff volume for the melt season and the unconditional flow in each period within the melt season are approximated using three-parameter log normal distributions (LN3). Conditional means, skew coefficients, and covariance between periods are calculated. Uniform transformation methodology is necessary to estiamte quantiles in a multivariate Gaussian domain. These quantiles are then inversely transformed to yield flow quantities. (Cassar-FRC)
W81-01557

HYDROLOGIC REGRESSION WITH WEIGHTED LEAST SQUARES,
Geological Survey, Reston, VA.
G. D. Tasker.
Water Resources Research, Vol 16, No 6, p 1107-1113, December, 1980. 3 Tab, 10 Ref.

Descriptors: *Hydrology, *Streamflow, *Regression analysis, Peak discharge, Time series analysis, Mathematical studies, Model studies, Basins, Drainage area, Equations, Least squares method, *Flow characteristics.

Weighted least squares regression was found more accurate than ordinary least squares regression in a model simulation to calculate streamflow characteristics from basin characteristics for times and places where gaging data is lacking. The weighting function assumes the dependent variable to be a T-year peak discharge estimated by fitting the common logarithm of the observed annual peak discharge to a Pearson type 3 distribution. Although the model simulated a 50-year peak discharge, weighted least squares regression would be expected to have a greater advantage over ordinary least squares for a 100-year peak discharge. (Cassar-FRC)
W81-01558

ECOLOGICAL STUDIES ON THE SUDANESE NILE SYSTEM,
Gezira Univ., Wad Medani (Sudan).
M. E. M. Beshir, and A. I. El-Moghraby.
Water Supply and Management, Vol 4, No 1/2, p 25-28, 1980. 1 Tab, 10 Ref.

Descriptors: *River flow, *Sedimentation rates, *Ecological distribution, Dominant organisms, River basins, Silts, Limnology, Hydrologic aspects, Vegetation, *Nile River.

Ecological studies on the Sudanese Nile River system are reviewed, beginning with the works of mid-eighteenth century explorers and including the modern works of H. E. Hurst and others. Over half of the Nile's length lies in the Sudan, and counting tributaries, 6000 km of river are available for study. The first phase of studies documented the various hydrobiological aspects of the river, including limnology, water chemistry, fish, and vegetation. The second phase is purely ecological

and was prompted by the need to accumulate accurate data during a time of rapid development. Current research projects include studies of the swamps, flood plains, and toich areas. Investigations of the limit and distribution of aquatic plants and studies of the White Nile north of Malakal are also ongoing. The White Nile studies hope to determine the seasonal sediment transport and deposition, evaporation losses, spread of aquatic weeds, and the distribution of fish, phytoplankton, and zooplankton. (Small-FRC)
W81-01563

2F. Groundwater

MODELING GROUNDWATER FLOW OVER SLOPING BEDS,
New South Wales Univ., Kensington (Australia). Dept. of Civil Engineering.
T. G. Chapman.
Water Resources Research, Vol 16, No 6, p 1114-1118, December, 1980. 7 Fig, 1 Tab, 23 Ref.

Descriptors: *Groundwater movement, *Dupuit-Forchheimer theory, *Slopes, Hydraulic gradient, Flow, Subsurface flow, Uniform flow, *Model studies, Mathematical models.

The Dupuit-Forchheimer approach to problems in unconfined groundwater flow over a sloping bed assumes that stream lines are horizontal for small inclinations of the free surface and that the hydraulic gradient is equal to the slope of the free surface, not varying with depth. A simpler expression for numerical modeling, using horizontal and vertical axes, is developed for slope angles up to 30 degrees. Testing on two situations, uniform recharge to ditches on a sloping bed and steady flow through a dam with vertical faces, shows good results using the extended Dupuit-Forchheimer equation. Comparisons of the standard versus the extended equation show that the standard approach is satisfactory for slopes up to 10 degrees where the flow is essentially horizontal. The extended assumptions are more accurate at larger angles and when the free surface and bed level contours have similar patterns. (Cassar-FRC)
W81-01518

A SEMIANALYTICAL SOLUTION FOR PARTIAL PENETRATION IN TWO-LAYER AQUIFERS,
Pahlavi Univ., Shiraz (Iran).
I. Javandel, and P. A. Witherspoon.
Water Resources Research, Vol 16, No 6, p 1099-1106, December, 1980. 12 Fig, 1 Tab, 26 Ref.

Descriptors: *Aquifer testing, *Drawdown, *Flow measurement, Laplaces equation, Water wells, Wells, Aquifers, Groundwater movement, Pumping tests, Permeability, Porous media, Recharge, Subsurface waters, Natural recharge, Model studies, Mathematical models.

A semianalytical solution is presented for the problem of drawdown distribution in a 2-layer aquifer (the lower layer is very thick relative to the top layer) drained by a well which penetrates only the top layer. Numerical inversion of the Laplace transformation was applied to several practical cases: (1) the depth of penetration of the well equals the total thickness of the top layer and the permeability of the lower layer vanishes, (2) the permeability of the lower layer is zero, (3) the flow properties of both layers are identical, (4) the pumping well penetrates all the way through the top aquifer. In short intervals of time, drawdown in the pumped layer resembles the case of partial penetration in a single layer with the same properties. The effects of partial penetration disappear as distance exceeds 1.5 times the thickness of the pumped layer (single-layer aquifer). (Cassar-FRC)
W81-01555

2G. Water In Soils

FINITE ELEMENT ANALYSIS OF SOLUTE TRANSPORT UNDER HYSTERETIC UNSATURATED FLOW CONDITIONS,
National Hydrology Research Inst., Ottawa (Ontario).
J. F. Pickens, and R. W. Gillham.
Water Resources Research, Vol 16, No 6, p 1071-1078, December, 1980. 8 Fig, 1 Tab, 36 Ref.

Descriptors: *Hysteresis, *Solutes, Model studies, *Soil water movement, Hydrologic properties, Flow, Unsaturated flow, Saturated flow, Pressure head, Soil moisture, Time lag, Hydraulic properties, *Finite element analysis.

A model for the two-dimensional simulation of the transient movement of water and solutes in saturated-unsaturated soils was formulated by incorporating the Gillham representation of a hysteretic water content-pressure head relation into the nonhysteretic finite element model of unsaturated-unsaturated solute transport described by Pickens. The flow portion of the model agreed with results reported by Gillham, and the solute transport portion compared well with Pickens' analytical solution results. The model was applied to a hypothetical case involving the one-dimensional transport of a slug of water containing a nonreactive tracer during an infiltration-redistribution sequence in a vertical column of sand. Simulations were conducted using hysteretic and nonhysteretic properties given by either the main drying or the main wetting curve. The effect of including or neglecting hysteresis was greatest in the pressure head and water content profiles and of minor importance in the concentration profiles. The differences in hysteretic and nonhysteretic concentration profiles were not large and, for practical problems, are probably within the limits of uncertainty associated with the measurement of soil parameters. (Cassar-FRC)
W81-01556

2H. Lakes

INVESTIGATIONS OF WALKER LAKE, NEVADA: DYNAMIC ECOLOGICAL RELATIONSHIPS,
Nevada Univ. Systems, Reno. Desert Research Inst.
D. L. Koch, J. J. Cooper, E. L. Lider, R. L. Jacobson, and R. J. Spencer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-160970, Price codes: A10 in paper copy, A01 in microfiche. Publication No 50010, 1979. 191 p, 45 Fig, 37 Tab, 128 Ref. OWRT-C-6158(No 5236)(2) and C-7180 (No 6216)(2), 14-34-0001-5236, 6216.

Descriptors: *Ecosystems, *Water quality, *Aquatic environment, Food chains, Salmonids, Saline water, Aquatic microorganisms, Benthos, *Lakes, Algae, Cyanophyto, Hypolimnion, Environmental effects, Fish, Zooplankton, Nevada, Walker Lake(NV).

Water quality conditions of Walker Lake were found to be fairly homogeneous. Upstream diversions have resulted in a deficit water balance of the lake of 1 - 1.25 m per year since the turn of the century and a current level of 10,700 mg/l of T.D.S. The blue-green algae, Nodularia spumigena, was dominant over other algal species. A large buildup of sinking organic matter results in large oxygen demands in the hypolimnion and has become limiting to other biological populations. The benthos communities have become limited to a narrow littoral zone which limit the availability of food supplies for the Lahontan cutthroat trout juveniles. The zooplankton community is limited to three species with Diaptomus sicilis dominating. The trout population, which has been maintained through hatchery stocking programs, experience several limiting conditions; while the dominant fish species, tui chub, were found to be reproducing successfully and are quite adaptable. They form the major source of food for the adult Lahontan cutthroat trout in the lake. Exotic fish species bioassays indicated that none were able to survive 100% Walker Lake water.
W81-01426

NUTRIENT RUN-OFF FROM THE CATCHMENT AREA TO A SMALL LAKE WITH NO EFFLUENT,
Instytut Gleboznawstwa i Chemii Rolnej, Lublin (Poland).
For primary bibliographic entry see Field 5C.
W81-01553

A MODEL OF THE MEAN FIELD DISTRIBUTION OF A DISSOLVED SUBSTANCE WITHIN THE RIVERINE LAYER OF A FJORD LAKE,
National Water Research Inst., Burlington (Ontario).
P. F. Hamblin, and E. C. Carmack.
Water Resources Research, Vol 16, No 6, p 1094-1098, December, 1980. 6 Fig, 11 Ref.

Descriptors: *Fjords, *Lakes, *Mixing, Diffusion, Kootenay Lake(BC), Duncan River(BC), Kootenay River(BC), *British Columbia, Inflow, Path of pollutants, Rivers, Canada, Water pollution, Dispersion, Diffusivity.

The time-averaged distribution of a dissolved substance in a fjord system was determined for Kootenay Lake in British Columbia. This lake, 100 km x 4 km x 150 meters deep, is fed by two rivers entering at 180 degrees. Using advection-diffusion equations, a horizontal dispersion coefficient of 300 square meters per second was deduced by matching the predictions to the horizontal distribution of vertically averaged conductivity over the riverine layer. A vertical turbulent diffusivity of 0.000005 square meters per second was inferred for the riverine layer. Limits of the model were as follows: negligible tidal and wind influence, same temperature and salinity of incoming rivers, extension of riverine layer across the width of the fjord. (Cassar-FRC)
W81-01554

ECOLOGICAL STUDIES ON THE SUDANESE NILE SYSTEM,
Gezira Univ., Wad Medani (Sudan).
For primary bibliographic entry see Field 2E.
W81-01563

ECOLOGICAL ASPECTS OF LAKE NASSER-NUBIA,
B. Entz.
Water Supply and Management, Vol 4, No 1/2, p 67-72, 1980. 2 Fig, 1 Tab, 6 Ref.

Descriptors: *Reservoirs, *Succession, *Reservoir stages, Dominant organisms, Diptera, Insects, Lake stages, *Ecology, Vegetation establishment, Fish, *Nile River.

Succession of animal and plant communities during the first 10 years' existence of two manmade lakes, Lake Nasser and Lake Nubia, is discussed. The development and decline of chironomid swarms is compared to similar phenomena observed on other manmade lakes. Their feeding habits and their role as food for fish, toads, spiders, and other insects indicated that they played an important role as food organisms for many animals and insects. About the time the chironomid swarms diminished, large numbers of water bugs (corixids) became common. Fish in the reservoir seemed to cause the eventual disappearance of the bugs. The succession of under water plants was: algal epitecton, Chara fields, submerged macrophytes. Succession in lake shore vegetation was: Glinus lotoides and other weeds, desert plants, Tamarix nicotica, and the reappearance of river grass. Plants and animals were often the types found in the original river, and Nile flooding caused the re-introduction of several species. The possible role of the microclimate in limiting the dispersion of organisms in the two lakes is discussed. (Small-FRC)
W81-01564

THE WATER BUDGET OF LAKE QARUN AND ITS PHYSICO-CHEMICAL CHARACTERISTICS,
Economics, Statistics, and Cooperatives Services, Broomall, PA.

H. M. Bishai, and S. Y. Kirollus.
Water Supply and Management, Vol 4, No 1/2, p 93-97, 1980. 1 Fig, 1 Tab, 13 Ref.

Descriptors: *Water levels, *Reservoir stages, *Salinity, Brackish water, Reservoirs, Agricultural chemicals, Salts, Irrigation water, Nile River, *Egypt, Lake Qarun(Egypt), *Hydrologic budget.

The changing water level and the changing physico-chemical characteristics of Lake Qarun, Egypt, were investigated. Over the past 20 years the fresh water fauna of the lake have disappeared, and it is now a brackish lake with a maximum chlorosity of 19.97 g/liter. The average depth of the lake is 4 m, with a range of 2 to 8 m. Eighty-six percent of the total water budget of the lake comes from irrigation water drainage. During 1976, the lake area was 240.3 sq km and the average water level was -43.705 m below sea level. Chlorosity levels have changed over the years; Lucas measured 5.6 g/liter in 1906, Gorgy measured 13.87-16.1 g/liter in 1950-51, and Bishai and Kirollus measured 19.97 g/liter in 1978. Oxygen content ranges from 4.1 to 6.2 ml/liter, and transparency ranges from 450 cm to 705 cm. (Small-FRC)
W81-01565

PHYSICO-CHEMICAL CONDITIONS, FAUNA AND FLORA OF LAKE MANZALA, EGYPT,
Alexandria Inst. of Oceanography and Fisheries (Egypt).
A. H. Shaheen, and S. F. Yousef.
Water Supply and Management, Vol 4, No 1/2, p 103-113, 1980. 1 fig, 5 Tab, 14 Ref.

Descriptors: *Fish, *Lakes, *Water chemistry, Water analysis, Benthic fauna, Water quality, Dominant organisms, Salinity, Zooplankton, Algae, Nile River, *Egypt, *Manzala Lake(Egypt).

Because of its importance in the fisheries industry, Manzala Lake, Egypt, was studied to determine the physico-chemical conditions of the lake and its fauna and flora. Special attention was given to the effect of the cessation of the Nile flood. Oxygen content is high in the lake throughout the year. No differences were noticed in the chlorosity of the lake after the cessation of flood waters, primarily because excess drainage water has flowed into the lake. Slight lowering of chlorosity was recorded in 1967, which was attributed to the non-excavation of the sea-lake connections. The lake contributes 30% of the total fish yield for Egypt. Tilapia species fish are most abundant, followed by mullets. Zooplankton is comprised of fresh-water rotifers and cladocera and marine neritic copepods. Salinity of the water seems to control their occurrence. The algal flora of the lake is poor, with only a few of the halophytic type. A few benthonic genera and the planktonic genus Globigerina make up the foraminiferal content of the lake. (Small-FRC)
W81-01567

STUDIES ON THE CHANGES OF SOME ECOLOGICAL FACTORS AFFECTING FISH LIFE IN LAKE QARUN, FAIYUM, EGYPT,
Faculty of Science, Sohag (Egypt). Dept. of Zoology.
F. A. Boraey.
Water Supply and Management, Vol 4, No 1/2, p 99-102, 1980. 3 Tab, 7 Ref.

Descriptors: *Salinity, *Fish, *Lake stages, Marine fish, Evaporation, Irrigation water, Salts, Agricultural chemicals, Nile River, Environmental effects, Ecosystems, Ecology, Salt tolerance, *Egypt, *Lake Qarun(Egypt).

The increased salinity of Lake Qarun was investigated. Lake Qarun is located in the Faiyum Depression in the western desert of Egypt. Salinity levels in the lake have been increasing due to agricultural drainage, high summer evaporation, and low rainfall in the area. Presently the lake has the salinity level of the Mediterranean, 36-38%, and the percentage compositon of the salt is 64.97 NaCl, 16.77 MgSO4, 11.76 Na2SO4, and 3.35 CaSO4. The salinity of the lake is increasing at a rate of 0.5-0.8 g/liter annually. Salt-tolerant fish introduced into the lake will not be able to tolerate higher salt levels. Thus, the rate of increase of salinity of the lake must be decreased by salt extraction, or new fish must be introduced from the Red Sea which has a higher salt level. Fresh water fish have completely disappeared from the lake and unless further action is taken, all economically important fish will disappear from the lake. (Small-FRC)
W81-01568

IDENTIFICATION OF A DYNAMIC LAKE MODEL BY THE GROUP METHOD OF DATA HANDLING: AN APPLICATION TO LAKE ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario).
H. Tamura, and E. Halfon.
Ecological Modelling, Vol 11, No 2, p 81-100, November, 1980. 7 Fig, 4 Tab, 23 Ref.

Descriptors: *Mathematical models, *Water quality, *Phosphorus, *Lake Ontario, Lakes, Water temperature, Water pollution effects, Forecasting.

A revised algorithm of the group method of data handling was used to model and identify water quality dynamics in Lake Ontario. The variables were CHLA, volume-averaged over the top 20 m, and SRP in three layers: 0-20 m, 20-40 m, and from 40 m to the bottom. Inputs were the average quarterly temperatures for each layer as observed over ten years, and total phosphorus loadings. The simulations represented the data used quite well and also described the possible behavior of Lake Ontario when subjected to different possible loading regimes. Two kinds of models are presented: recursive and iterative. They were used to simulate long-term predictions for three different rates of phosphorus loadings. Models using the group method of data handling can be used to develop lake models at low costs in manpower and computer time. (Small-FRC)
W81-01578

FIELD INVESTIGATIONS AND MODEL SIMULATION OF THE DYNAMICS OF ZOOPLANKTON POPULATIONS IN FRESH WATERS,
Technische Univ., Dresden (German D.R.). Bereich Hydrobiologie.
W. Horn, and J. Benndorf.
Internationale Revue der Gesamten Hydrobiologie, Vol 65, No 2, p 209-222, 1980. 14 Fig, 11 Ref.

Descriptors: *Mathematical models, *Zooplankton, *Reservoirs, Productivity, *Aquatic populations, Simulations, Daphnia, Growth rates, Fecundity, Mortality.

The main parameters characterizing the dynamics of a zooplankton population in fresh waters were investigated through field tests at the Saidenbach reservoir and by means of an ecological model. Productivity of the population of Daphnia hyalina was determined using a graphic method, a numerical method which disregarded continuous change in weight increase, and an expontential model. Field investigations showed that figures characterizing biomass and net growth performance alone did not give an adequate insight into the dynamics of the zooplankton population. It was also necessary to determine gross performance. Overall, the results of field investigations and the modelling results were in good agreement. The net growth rate of Daphnia hyalina was 0.1-0.2/d at the beginning of their mass development and later took on usually negative values between 0.02 and 0.1/d. The birth rate (gross growth rate) fluctuated roughly between 0.03 and 0.1/d. High mortality rates of about 0.1/d were encountered mainly during the summer. (Small-FRC)
W81-01591

INFLUENCE OF HYDROLOGICAL FACTORS ON THE SEASONAL ABUNDANCE OF PHYTOPLANKTON IN KINJHAR LAKE, PAKISTAN,
Karachi Univ. (Pakistan). Dept. of Zoology.
S. Nazneen.
Internationale Revue der Gesamten Hydrobiologie, Vol 65, No 2, p 269-282, 1980. 5 Fig, 1 Tab, 40 Ref.

Descriptors: *Phytoplankton, *Seasonal, *Artificial lakes, Light, Temperature, Effects, Eutrophication, Phosphorus, Nitrogen, Winds, Fish, *Pakistan, Kinjhar Lake(Pakistan).

The seasonal distribution of phytoplankton in Kinjhar Lake, an artifical lake located 120 km north of Karachi, Pakistan, was investigated with emphasis on the influence of hydrological factors. The abundance of phytoplankton especially Microcystis aeruginosa, generally followed seasonal changes in light and temperature. Highest atmospheric and water temperatures were observed in May and June; minimums occurred in January. Kinjhar Lake is highly eutrophic, and nutrients were generally present in high levels throughout most of the year. During short periods when they were in short supply, phosphorus and nitrogen were limiting factors for phytoplankton. Oxygen and carbon dioxide supply in the water was uninterrupted and adequate because of continuous movement of the water due to wind. Kinjhar Lake supplies water to the population of Karachi, and it is hoped that a sufficient fish population for fishing can be developed in the lake. This study determined that phytoplankton to feed fish is available throughout most of the year, except in times of unusually low nutrient load. (Small-FRC)
W81-01593

THE ROLE OF PREDATION IN CAUSING MAJOR CHANGES IN THE LIMNOLOGY OF A HYPER-EUTROPHIC LAKE,
University of East Anglia, Norwich (England). School of Environmental Sciences.
R. T. Leah, B. Moss, and D. E. Forrest.
Internationale Revue der Gesamten Hydrobiologie, Vol 65, No 2, p 223-247, 1980. 8 Fig, 2 Tab, 41 Ref.

Descriptors: *Predation, *Fish, *Eutrophication, Zooplankton, Phytoplankton, Effects, *Limnology, Distribution patterns, Aquatic populations, Artificial lakes, *United Kingdom.

The role of predation in causing major changes in the limnology of a hyper-eutrophic lake was investigated in a shallow man-made lake divided into two basins by an earth dam. Fertile river water fed both basins, and the water chemistry of the two basins was very similar. Initially, both areas had turbid water with heavy phytoplankton crops, cyclopoid copepods and rotifers in the zooplankton, a benthic animal community of chironomids and oligochaetes which was not diverse, and virtually no submerged or floating macrophytes. Later, the area which was more isolated from river water had clear water. Phytoplankton was sparse, and zooplankton was dominated by Cladocera. Submerged and floating macrophytes were abundant, and a relatively diverse benthic fauna developed. These changes were attributed to a large reduction in the fish population of the isolated basin due to predation by cormorants. This led to decreased fish predation on zooplankton and an increase in larger, efficiently grazing Cladocera. Reduction of fish numbers may not give the same result when the water is not flushed regularly as it was in this case. (Small-FRC)
W81-01594

ON THE MECHANISM REDUCING THE PHOSPHATE CONCENTRATION IN THE WATER OF LAKE BALATON,
Research Inst. for Water Resources Development, Budapest (Hungary). Inst. for Water Quality Control.
For primary bibliographic entry see Field 5C.
W81-01597

A LIMNOLOGICAL RECONNAISSANCE OF THE LOUGH ERNE SYSTEM, IRELAND,
Ministry of Agriculture, Antrim (Northern Ireland). Freshwater Biological Investigation Unit.
C. E. Gibson, R. H. Foy, and A. G. Fitzsimons.

Internationale Revue der Gesamten Hydrobiologie, Vol 65, No 1, p 49-84, 1980. 22 Fig, 9 Tab, 24 Ref.

Descriptors: *Erne Lake(Ireland), *Lakes, *Limnology, Zooplankton, Phytoplankton, *Eutrophication, *Ireland, Algae, Chlorophyll, Aquatic life, Nutrients, Phosphates, Phosphorus compounds, Nitrates, Rotifers, Crustaceans, Copepods.

The eutrophic Erne Lake system was surveyed to document nutrient budgets, physical factors, phytoplankton, and zooplankton. The two lakes are interconnected by a channel. The upper lake is shallow with deep local areas; the lower is deep in the center and shallow near the numerous islands. Phosphorus loading in the upper lake was heavy, being related to the heavier population density in the basin. The total nitrogen to total phosphorus ratio varied widely throughout the year, rarely staying in the 'ideal' range between 20:1 and 10:1. Water temperatures, levels, and coloration are described. Phytoplankton populations in the upper lake are similar throughout, but the lower lake's population varies quantitatively and qualitatively from place to place according to depth differences. This relation between algae growth and depth was seen in a chlorophyll-a fluorometric map of the lower lake's surface. Species composition of zooplankton was similar throughout both lakes and exhibited seasonal variations. (Cassar-FRC)
W81-01598

AMMONIA MINERALIZATION AND CYCLING IN SHAGAWA LAKE, MINNESOTA,
Oklahoma State Univ., Stillwater. School of Biological Sciences.
D. Toetz, and B. Cole.
Archiv fur Hydrobiologie, Vol 88, No 1, p 9-23, February, 1980. 1 Fig, 8 Tab, 35 Ref.

Descriptors: *Cycling nutrients, *Ammonia, *Lakes, Euphotic zone, Eutrophication, Nitrate, Tracers, Nitrogen, Nutrients, Phosphorus, Phytoplankton, Streamflow, Precipitation, Sewage effluents, Path of pollutants, Minnesota, *Shagawa Lake(MN).

The rates of ammonia mineralization in Shagawa Lake, Minnesota, were measured by an isotope dilution method with labeled ammonium ion as tracer. Results were compared to uptake rates of nitrate and ammonia, rates of N2 fixation, and changes in ammonia concentration in the euphotic zone due to streamflow, precipitation and sewage discharge. In 1975, rates of ammonia mineralization ranged from 93 to 412 micrograms ammonia-N/liter/day. Turnover times for particulate nitrogen (PN) and ammonia pools were 0.89 and 0.21 days, respectively. The highest ammonia mineralization rates were observed after algal blooms. Total uptake was always less than mineralization, and indicated a turnover for the PN pool of 4-5 days in June and July and 18-53 days in late July and August. During early summer when algal biomass was low and photosynthesis rates were high, total uptake was highest, and 2-90% was due to N2 fixation. The ammonia input by sewage effluent was 16-150% of the ammonia uptake rate. Ammonia mineralization rates in August were assumed to be adequate to meet phytoplankton nitrogen demands. (Geiger-FRC)
W81-01609

2J. Erosion and Sedimentation

SEDIMENT LOADS FROM HEADWATERS OF THE EAST-CENTRAL SIERRA WATERSHEDS,
Nevada Univ. System, Reno. Water Resources Center.
J. A. Nadolski, J. C. Brown, and C. M. Skau.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-160988, Price codes: A03 in paper copy, A01 in microfiche. Publication No 43009, 1980. 21 p, 4 Fig, 5 Tab, 34 Ref. OWRT-A-078-NEV(1) and A-088-NEV(1), 14-34-0001-7060, 9030.

Descriptors: *Sediment load, *Bed load, *Suspended load, *Forest watersheds, Forecasting, Headwaters, Runoff, Snowmelt, *Sierra Nevada, Truckee River, Carson River, Walker River.

Bedload and suspended sediments were measured for 14 forested watersheds in east-central Sierra Nevada. These are the first known bedload estimates for this region. Snowmelt produced about 90% of annual total sediment yield, and bedload accounted for 20 to 60% of snowmelt yield, stressing the need for selective but comprehensive sampling for management decisions. Empirical predictive equations, based on regression analyses of 13 independent variables, were used to predict 1979 yields. R sup 2 values averaged about 0.88 and standard errors of estimate averaged about 25%. 't' tests of: (1) % bare ground, and (2) length of channels greater than 0.1 meter, showing field evidence of flow during 1978 snowmelt, showed only the latter as significant in predicting sediment yield. This tends to confirm importance of channel network as primary sediment source and subsurface flow as the dominant runoff process. Forest Service channel rating system and channel length from USGS topographic maps were poorly related to sediment yield.
W81-01427

FLUVIAL GEOLOGY AND ARCHAEOLOGY OF THE HOUSATONIC RIVER VALLEY IN NORTHWESTERN CONNECTICUT,
Wesleyan Univ., Middletown, CT. Dept. of Earth and Environmental Sciences.
A. W. Burnett.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-163602, Price codes: A04 in paper copy, A01 in microfiche. BA Thesis, June, 1980. 69 p, 17 Fig, 3 Tab, 27 Ref. OWRT-A-078-CONN(1), 14-34-0001-7014.

Descriptors: *Fluvial sediments, *Geologic formations, *Recent epoch, *New England, Geologic history, Geomorphology, Rivers, Landforms, Terraces(Geologic), Bedrock, Geohydrologic units, Channel morphology, Connecticut, *Housatonic River(CT).

The Housatonic River is a glacially modified high gradient New England River that downcut to its present level at least 2500 years ago. The bedrock underlying the river valley affected the glacial development of the valley, the fluvial terrace and floodplain morphology, and the gradient of the present river channel. The low gradient reaches contain level, paried terraces; the high gradient reaches contain sloped, unpaired terraces. The highest fluvial terraces have well developed soil horizons; the lower terraces and present floodplains show no soil horizon development. The relationship of flood discharge (Q) to flood recurrent interval (r.i.), and flood height to r.i. are both direct. The flood elevation varies along the river for a given r.i.
W81-01496

EFFECT OF CHISEL VERSUS MOLDBOARD PLOWING ON SOIL EROSION BY WATER,
Purdue Univ., Lafayette, IN. Agricultural Experiment Station; and Science and Education Administration, Lafayette, IN.
C. B. Johnson, and W. C. Moldenhauer.
Soil Science Society of America Journal, Vol 43, No 1, p 177-179, 1979.

Descriptors: *Erosion, *Runoff, Surface residue, Rainulator studies, Infiltration, *Soil erosion, Rainfall-runoff relationships, Land use, Effects, Sediment transport, Agriculture, Plowing methods, *Soil conservation.

An experiment using simulated rainfall on a field that was chisel plowed annually for 13 years before the experiment to compare erosion from this condition with moldboard plowing in the same field. One treatment was fall moldboard plowed, a second fall chiselled with some residue left on the surface, and a third was untilled in the fall with all residue removed in the spring. All three treatments were disked lightly in the spring. After the initial experiment was completed, residue was added so that all treatments had about 20% surface cover. During the initial rain application with no residue added, soil losses from the third treatment without surface residue were the same as those from the chisel plowed and disked surface with some surface residue. Both these treatments had only 23% of the soil loss of the moldboard plowed and disked treatment. During succeeding simulated rainfall under wet and very wet soil conditions, soil loss from the disked only treatment was up to 80% of that for the moldboard-plowed treatment. When residue was added to all treatments, soil loss from the chisel-plowed treatment was less than one-half that from the moldboard-plowed treatment.
W81-01500

SIZE DISTRIBUTION OF ERODED MATERIAL FROM SIMULATED RAINFALL: EFFECT OVER A RANGE OF TEXTURE,
Purdue Univ., Lafayette, IN.; and Science and Education Administration, Lafayette, IN.
D. Gabriels, and W. C. Moldenhauer.
Soil Science Society of America Journal, Vol 42, No 6, p 954-958, 1978. 1 Fig, 4 Tab, 16 Ref.

Descriptors: *Rainfall, *Erosion, *Soil texture, Splash erosion, Wash erosion, Surface seal, Runoff, Soil detachment, Erosion mechanics, Rainfall simulation, Sediment transport, Particle size, Sediment distribution.

Size distribution of eroded material has implications in deposition mechanics and in carrying capacity for pollutant materials. Dispersed clay, especially the expanding lattice types, has a high carrying capacity for pollutant materials. This study reports size distributions and composition of material detached by water drops and transported in shallow flow. The size distributions of aggregates and primary particles in the splashed, washed, and seal material at different times during a laboratory simulated rainfall were compared for different textured soils. The wash had more finer material than did the splash. The wash and splash material at equilibrium were not different from the original soil, while the seal of all soils had a larger silt content than the original soils. The silt loam soil had seals with about the same clay content as the original soil, while silty clay soils had seals with less clay than the original soils. Of significance from the study is the low percentage of dispersed clay being eroded compared to the percent of clay in the original soil and that this percentage didn't change significantly with time. The most striking differences were between soils and these were influenced mainly by texture and aggregate condition of the original soils.
W81-01501

SOIL AND WATER LOSSES FROM CORN-SOYBEAN ROTATIONS,
Science and Education Administration, Ames, IA.
J. M. Laflen, and W. C. Moldenhauer.
Soil Science Society of America Journal, Vol 43, No 6, p 1213-1215, 1979.

Descriptors: Erosion, Runoff, *Crop rotation, Watershed projection, Sediment concentration, *Water loss, *Soil erosion, Rotations, Effects, Corn, Soybeans, *Experimental forms, Soil conservation.

It has been observed by some that there was greater soil erosion by wind and water following production of soybeans. An experiment was conducted to measure the actual erosion following soybean production compared to that following corn production. Using natural rainfall plots at Beaconfield, Iowa, soil and water losses were measured from soybeans in a corn-soybean rotation and from corn in this same rotation and grown continuously over a 7-year period. Soil losses were found to be greater following soybeans than following corn in either a corn-soybean rotation or in continuous corn. This means more precautions must be taken to control erosion when soybeans are grown on sloping lands than when corn is grown.
W81-01502

TRANSITIONAL PERIODIC BOUNDARY LAYER STUDY,

Iowa Univ., Iowa City. Inst. of Hydrology Research.
B. R. Ramaprian, and A. Mueller.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 106, No HY12, p 1959-1971, December, 1980. 7 Fig, 17 Ref.

Descriptors: *Flow characteristics, *Reynolds number, *Boundary layers, *Sediment transport, Flow rates, Velocity, Turbidity, Laboratory tests, Mathematical studies.

A periodic oscillatory flow was studied which closely approximated the wave boundary layer. Periodic oscillatory flows are important in the study of sediment transport and other practical hydraulic and coastal engineering topics. Sediment transport is very sensitive to the bed shear stress and therefore to the nature of flow in the wave boundary layer. The experiments indicated that this type of flow can be turbulent at a Reynolds number considerably lower than the critical value for transition for flow over an oscillating flat plate. Detailed velocity measurements were made using laser Doppler nemometry and a digital data acquisition technique which isolated and measured the periodic and random components of the velocity. The behavior of the periodic aspect of the transitional flow was only slightly different from that predicted for a laminar periodic flow at the same oscillation frequency. The turbulent intensities were significant, but were lower than those for fully turbulent boundary layers. (Small-FRC)
W81-01536

SEDIMENT RUN-OFF FROM THE CATCHMENT AREA OF THE CARPATHIAN RIVERS,
Institute of Meteorology and Water Management, Warsaw (Poland).
J. Branski.
Acta Hydrobiologica, Vol 22, No 1, p 89-100, 1980. 1 Fig, 10 Ref.

Descriptors: *Erosion rates, *Rivers, *Sediment yield, Sediment transport, Runoff, Silts, Equations, Watersheds(Basins), Sediments, Water pollution sources, *Poland, Carpathia.

Measurements of sediment load of the Carpathian rivers (Poland) were used to estimate sediment runoff from the catchment area. Measurements of the silt charge (concentration of suspensions in water expressed in g/cu m) and daily water yields were used to calculate the silt charge. Formulae are presented for calculating indices of sediment runoff. Indices of the load of suspension runoff were calculated from the average annual load of suspension discharge in the cross sections of 22 rivers. The indices range from 30 t/sq km to 160 t/sq km. The indices of sediment runoff can be used for rating the erosion processes in the catchment basin. The intensity of erosion is closely connected to the amount of silt in a river. The indices are more reliable than other methods for giving a spatial distribution of this phenomenon. (Small-FRC)
W81-01552

SEDIMENTATION PROCESSES IN THE RESERVOIR LAKE NASSER-NUBIA DURING 1965-1974 AND FUTURE ASPECTS,
B. A. G. Entz.
Water Supply and Management, Vol 4, No 1/2, p 63-66, 1980. 6 Ref.

Descriptors: *Reservoir silting, *Reservoirs, *Mollusks, Mussels, Sediment transport, Lakes, Sedimentation rates, Currents(Water), *Sediment load, *Egypt, Lake Nasser-Nubia(Egypt).

The sedimentation problems in the manmade reservoir Lake Nasser-Nubia were investigated to determine the future of the lakes. The areas of sedimentation, their extension, and their main characteristics were determined, along with the effects of currents. Changes in benthos, particularly molluscs and oligochaetes, since the formation of the lakes were also studied. The bulk of suspended silt was sedimented around the previous second cataract, and the layers were already 10 to 25 m thick in 1974. Heaviest sedimentation took place beside the old river channel in the northern part of the lakes, while north of Wadi Halfa the heaviest sedimentation was in the old river channel itself. There was some correlation between the rate of sedimentation and the stratification of molluscs. In the southern area with a well-defined river bed, there were more than 100 living mussels per sq m. There were no mussels in the central sedimentation area. Only empty shells were found in Lake Nasser, which has poor oxygen levels. (Small-FRC)
W81-01562

HEAVY MINERAL DISTRIBUTION IN BOTTOM SEDIMENTS OF THE BRISTOL CHANNEL, U.K.,
University Coll. of Swansea (Wales). Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W81-01582

CONTRIBUTION TO THE STUDY ON BOTTOM SEDIMENT IN LAKE BALATON. I. DETERMINATION OF PHOSPHORUS MINERALS IN THE SEDIMENT,
Research Inst. for Water Resources Development, Budapest (Hungary). Inst. for Water Quality Control.
E. Dobolyi, and G. Bidlo.
Internationale Revue der Gesamten Hydrobiologie, Vol 65, No 4, p 489-497, 1980. 8 Fig, 3 Tab, 26 Ref.

Descriptors: *Phosphorus, *Lake sediments, *Bottom sediments, *Water pollution sources, Mineralogy, X-ray diffraction, Eutrophication, Electron microscopy, Lakes, Hungary, Lake Balaton.

Chemical, electron microscope, and X-ray diffraction analysis were used to determine the presence of phosphorus containing minerals in the bottom sediment of Lake Balaton. The research was intended to demonstrate whether bottom sediment acted as a sink or source of phosphorus in the eutrophicated lake. A 10 cm thick sediment sample was taken at mid-lake in 4 m of water off Balatonszemes. The phosphorus content of 500-600 microgram/g proved relatively low, and phosphorus bearing minerals were not detected in the original sample under the electron microscope or by X-ray diffraction. The sample was then divided into fractions according to light or heavy mineral density, and was further analyzed using chemical and physical methods. In an enriched sample, the amount of calcium-bound phosphorus was increased to about 50 times the original concentration. In this sample, the presence of hydroxyapatite was found with the electron microscope, and hydroxyapatite and fluoroapatite were found using X-ray diffraction. No other phosphorus minerals were found. (Small-FRC)
W81-01590

EXPERIMENTS ON THE SIGNIFICANCE OF FLOCCULATION IN THE SETTLING OF FINE-GRAINED SEDIMENT IN STILL WATER,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
K. Kranck.
Canadian Journal of Earth Sciences, Vol 17, No 11, p 1517-1526, November, 1980. 6 Fig, 1 Tab, 26 Ref.

Descriptors: *Flocculation, *Settling velocity, *Sedimentation rates, Sediment sorting, Suspended solids, Sedimentology, Stokes Law, Particle size, Turbidity.

The effects of concentration, average grain size and sorting, and mineralogy on the settling rate of fine-grained sediment in still water as flocs and as single grains were studied. Both distilled water and saline solutions were used. In a flocculated suspension the decrease in concentration of a sediment with time was a function of the minus four-thirds power of the time. In salt water, single grain settling dominated over floc settling at lower concentrations. After an initial period, suspensions with different concentrations of suspended sediment attained equal concentrations. Flocs were composed of a mixture of grain sizes in proportion to their distribution in the suspension, all of which had lower settling rates than the floc. The size distribution of sediment remaining suspended after settling was the same as at the start, with the exception of some particles which settled out as single grains. Floc settling behavior was similar among different minerals of similar grain-size characteristics. (Cassar-FRC)
W81-01604

VERTICAL DISTRIBUTION OF METALS IN A SEDIMENT CORE OF A SUBALPINE LAKE INDICATING STAGES IN THE DEVELOPMENT OF CIVILIZATION. (VERTIKALE VERTEILUNG VON METALLEN IM SEDIMENT EINES ALPENVORLANDSEES ALS ZIVILISATIONSINDIKATOREN),
Munich Univ. (Germany, F.R.). Geographisches Inst.
For primary bibliographic entry see Field 5B.
W81-01610

2K. Chemical Processes

THE OXIDATION OF ARSENITE BY AQUATIC SEDIMENTS,
Saskatchewan Univ., Saskatoon. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W81-01525

2L. Estuaries

QUESTIONS ABOUT DREDGING AND DREDGED MATERIAL DISPOSAL IN LONG ISLAND SOUND.
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
Special Report 28, Reference 79-11 (1979). 136 p, 7 Fig, 7 Tab, 52 Ref, Append. Edited by J. R. Schubel, W. M. Wise and J. Schoof.

Descriptors: *New York, *Connecticut, *Dredging, *Estuaries, *Sedimentation, Turbidity, Tides, Mud, Particle size, Saline water-freshwater interfaces, Aquatic environment, Biomass, Currents(Water), Sediment distribution, Dissolved oxygen, Photosynthesis, *Long Island Sound.

A question and answer format provides a history of dredging and dredged material disposal, an assessment of its effects on the Sound and its biota, an examination of alternative modes of disposal and a discussion of research priorities. Three types of disposal areas are used for dredged material but the majority is dumped at open-water sites within the Sound. Since 1954, 80% of the dredged material has been disposed of at four sites. Three kinds of dredges---suction-cutterhead, hopper, and crane and bucket---are used, depending on the nature and location of the site, and the bidding process. There is concern that if contaminated dredged materials are physically, chemically or biologically reactive on long-term scales, adverse impacts on water quality and biota could occur. Short to intermediate impacts, however, have not been demonstrated. Reductions in benthic abundance, total biomass and species diversity usually occur after deposition of dredged material although repopulation is usually complete within 1 to 1 1/2 years. The type of dredged material, ranging from relatively clean to potentially hazardous, can affect this rate. The Army Corps of Engineers and the Environmental Protection Agency have adopted guidelines for evaluating dredged material and New York and Connecticut have both developed water quality standards pursuant to the 1972 Federal Water Pollution Control Amendments. Permits and certifications must be obtained from these agencies to carry out a dredging project. (Atkins-Omniplan)
W81-01432

QUESTIONS ABOUT DREDGING AND DREDGED MATERIAL DISPOSAL IN THE CHESAPEAKE BAY.

State Univ. of New York at Stony Brook. Marine Sciences Research Center.
Special Report 20, Reference 79-3 (1979). 143 p, 10 Fig, 10 Tab, 53 Ref, Append, 4 Maps. Edited by J. R. Schubel and W. M. Wise.

Descriptors: *Maryland, *Dredging, *Estuaries, *Sedimentation, *Chesapeake Bay, Turbidity, Density currents, Bottom organisms, Sand bars, Dissolved oxygen, Streamflow, Channels, Commercial fishing, Sport fishing, Aquatic habitats, Environmental effects.

The history of dredging and dredged material disposal in the Maryland portion of the Chesapeake Bay, an assessment of its effect on the Bay and its biota, an examination of alternative modes of disposal and a general discussion of research priorities is provided in a question-and-answer format. Agriculture, urbanization and other disturbances of the soil increase the rate of soil erosion and sediment to streams. Since 1870, nearly 82 million cubic yards of material has been removed from Baltimore Harbor Channels, 25% of which has been for maintenance purposes. Three common kinds of dredges are used—suction-cutterhead, hopper, and bucket and scow; the choice is determined by the nature and location of the disposal area and by economics. Environmental concerns regarding dredging include removal of benthic organisms, possible release of oxygen-consuming substances, release of nutrients causing increased phytoplankton production, release of toxic substances, and turbidity. Contaminated deposits may be mobilized and released in a variety of ways; however, the mobilization can be reduced. At disposal sites recolonization begins within a few weeks and is usually completed within 1 to 1-1/2 years. Large-scale dredging has concerned the public, but small to medium projects should be more carefully assessed for their cumulative effect. Monitoring of dredged material and disposal operations is necessary. (Atkins-Omniplan)
W81-01433

A SIMULATION MODEL OF ESTUARINE SUBSYSTEM COUPLING AND CARBON EXCHANGE WITH THE SEA. II. NORTH INLET MODEL STRUCTURE, OUTPUT AND VALIDATION,
South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal Research.
J. K. Summers, W. M. Kitchens, H. N. McKellar, Jr., and R. F. Dame.
Ecological Modelling, Vol 11, No 2, p 101-140, November, 1980. 11 Fig, 5 Tab, 62 Ref.

Descriptors: *Mathematical models, *Carbon, *Energy, *Estuaries, Flow, Model studies, Water temperature, Ambient light, Sea level, Mixing, Freshwater, Sea water, South Carolina.

A first-stage verified model of carbon/energy flux through the North Inlet marsh and estuarine system (Georgetown County, South Carolina) is presented. Forcing functions include sunlight, water temperature, remixing, and sea level. Equations are presented for gross primary production, respiration, egestion, excretion, migration, exchange between the marsh and the water column, organism mortality, tidal remixing, and energy balances. Initial conditions and flows are presented, and validation of the model is discussed. Sixteen of the 21 output variables were validated. The time series output for model compartments and overall system carbon flow were compared with observed data collected over the past ten years. The model is stable and can broadly reproduce some of the major trends of a salt marsh-estuarine system. (Small-FRC)
W81-01577

A NUMERICAL MODEL OF THE JAMES RIVER ESTUARY, VIRGINIA, U.S.A.,
Commonwealth Scientific and Industrial Research Organization, Vronulls (Australia). Div. of Fisheries and Oceanography.
J. S. Godfrey.
Estuarine and Coastal Marine Science, Vol 11, No 3, p 295-310, September, 1980. 6 Fig, 11 Ref.

Descriptors: *Computer models, *Estuaries, *Salinity, Density currents, Flow, Tides, Model studies, Rivers, *James River(VA), Virginia, Tidal effects, *Saline water-freshwater interfaces.

A numerical model is proposed of a partially mixed estuary, using as an example the James River Estuary (Virginia). Temporal changes in density current and vertical salinity stratification at a given point depend only on the longstream gradient of cross-sectional average salinity and the tidal speed averaged over the tidal period. The qualitative features of the solution are similar to those of real and laboratory model partially mixed estuaries. The simplicity of the model is demonstrated by the fact that a 62 day model run on the James River Estuary took only 2 seconds on a CDC-7600 computer. There was good agreement between the data set and the model. A surprising feature of the investigation was that the estuary responded rapidly and strongly to changes in salinity at the mouth. This is more important than changes in river flow or tidal speed in establishing variation in the cross-sectional average salinity in the James River. The physical reason for this is obscure. The model does not work for well-mixed estuaries or when the upstream influx of salt by tidal-induced eddies is considered. (Small-FRC)
W81-01581

VELOCITY SURGES AND ASYMMETRY IN TIDAL CHANNELS,
Hull Univ. (England). Dept. of Geography.
J. S. Pethick.
Estuarine and Coastal Marine Science, Vol 11, No 3, p 331-345, September, 1980. 8 Fig, 4 Tab, 11 Ref.

Descriptors: *Tides, *Water circulation, *Velocity, Mathematical models, *Estuaries, Channel morphology, Flow, United Kingdom.

A simulation model of tidal velocity based on morphological data collected in the Stiffkey marshes, Norfolk, is presented. Velocities predicted by the model are compared with field measurements taken at two stations on the marsh. Velocity surges appear to be a feature controlled by the three-dimensional geometry of the channel or channel system and independent tidal stage inputs. Two inputs necessary for velocity simulation are tidal data, one bankfull and the other 0.4 m overbank, and morphological data obtained by aerial photographs and mapping of the channel system. Shallow water asymmetric tides are responsible for velocity asymmetry, and the branching network of the channel system is primarily responsible for the position and strength of the velocity surges. Maximum surges are associated with the vastly increased discharge rates in channels as overbank tides spill into the marsh surface. Velocity in tidal marshes may be a useful indicator of the maturity of a channel system. (Small-FRC)
W81-01584

THERMALLY-INDUCED AIR AND WATER CIRCULATIONS IN ESTUARINE RIVERS,
Old Dominion Univ., Norfolk, VA. Dept. of Physics.
K. P. Chopra.
Estuarine and Coastal Marine Science, Vol 11, No 3, p 353-357, September, 1980. 1 Fig, 1 Tab, 5 Ref.

Descriptors: *Water circulation, *Mathematical models, *Estuaries, Heat transfer, Convection, Air circulation, Currents(Water), Currents(Air), Flow, Salinity, Winds, Rivers.

A physical theoretical model is presented which explains and predicts thermally induced air and water circulations introduced by contrasts in surface temperatures over an estuarine water and adjoining land mass. Air over an estuarine river is generally cooler than that over land, particularly during the summer days. This is because enhanced evaporative and radiative heat loss are caused by flow and convective transport of heat from subsurface layers. Temperature gradients in estuarine areas are larger than those encountered in sea breezes and cause stronger winds with deeper circulation cells. Increased salinity combined with these winds may induce a backward drift of surface water where downwelling occurs. Since there is no systematically recorded data, comparison of modelling results with field data is not possible. It is proposed that the friction constant for estuarine air probably exceeds 0.0001 per m. (Small-FRC)
W81-01585

CONTROL OF A FJORD BASIN'S DYNAMICS BY TIDAL MIXING IN EMBRACING SILL ZONES,
Evans-Hamilton, Inc., Seattle, WA.
C. C. Ebbesmeyer, and C. A. Barnes.
Estuarine and Coastal Marine Science, Vol 11, No 3, p 311-330, September, 1980. 13 Fig, 34 Ref.

Descriptors: *Tidal effects, *Fjords, *Water circulation, Mixing, Sea water, Washington, Currents(Water), Coasts, Freshwater, Flow, Hydraulic properties, Sills, *Puget Sound(WA).

The dynamics of a large fjord basin lying between comparatively deep sills where tidal mixing is vigorous, Puget Sound's Main Basin, were studied. Tidal action over the 44 m (landward) and 66 m (seaward) sills caused a vigorous two-layer circulation in the basin where no net motion occurred near the average depth of the embracing sills. In the case of a flood tide, upper-layer water was downwelled at the seaward sill and lower-layer water was upwelled at the landward sill. This circulation is quite active at all basin depths throughout the year. Currents were computed from differences in dissolved oxygen between hydrographic stations, and compared well with measured currents. Bulk residence time in the lower layer was found to be about three weeks, a short time for so large a fjord. The water blend in the basin averages about 90% oceanic water and 10% fresh water. The basin showed marked sensitivity to tidal action in the sill zones. Transport in the upper layer was directly proportional to the tidal prism inland of the landward sill zone, and there was an exponential response to abrupt changes in freshwater flowing into the seaward sill zone. (Small-FRC)
W81-01586

CONCENTRATION AND MICROBIOLOGICAL UTILIZATION OF SMALL ORGANIC MOLECULES IN THE SCHELDT ESTUARY, THE BELGIAN COASTAL ZONE OF THE NORTH SEA AND THE ENGLISH CHANNEL,
Brussels Univ. (Belgium). Lab. of Oceanography.
For primary bibliographic entry see Field 5B.
W81-01588

DISPERSAL OF MICROFUNGI IN THE THAMES RIVER ESTUARY OF EASTERN LONG ISLAND SOUND,
Connecticut Univ., Groton. Marine Science Inst.
J. C. Cooke.
Estuarine and Coastal Marine Science, Vol 11, No 5, p 537-545, November, 1980. 9 Fig, 1 Tab, 13 Ref.

Descriptors: *Fungi, *Estuaries, *Mixing, Sediment transport, Bioindicators, Microorganisms, Long Island Sound, *Thames River(CT), Connecticut, Soil fungi, Saline water-freshwater interfaces, River flow, Seasonal.

Terrestrial microfungi were used as bioindicators to study the movement of water and sediment in the Thames River Estuary, Long Island Sound. Samples collected at 6 stations in the river and in the sound east of the river mouth from February 1974, to August, 1976, revealed seasonal distribution patterns, reaching a maximum count in Nov.-May and a minimum in June-Sept. River bottom samples contained fewer colony-producing organisms than surface river water. The pH and concentration of total suspended matter had no significant effect on distribution of fungi. Temperature, precipitation, river discharge, and salinity showed correlation with fungi counts and are the major factors affecting dispersion of fungi. Movement and dispersion of microfungi were observed during mixing of river water and saline water. (Cassar-FRC)

W81-01589

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

PROCESS FOR INCREASING THE EXCHANGE YIELD IN ION EXCHANGE PROCESSES,
Sandor Vajna (Germany, F.R.). (Assignee).
For primary bibliographic entry see Field 5D.
W81-01459

APPARATUS FOR DESALINATING WATER,
R. E. Diggs.
U.S. Patent No 4,199,407, 18 p, 21 Fig, 5 Ref; Official Gazette of the United States Patent Office, Vol 993, No 4, p 1359-1360, April 22, 1980.

Descriptors: *Patents, *Desalination, *Desalination apparatus, *Solar radiation, Heat exchange, Separation techniques, Evaporation, Condensation, Equipment.

The saturation temperature of the contaminated water being vaporized by the distillation apparatus is very low as compared to the saturation temperature at atmospheric pressure. Furthermore, condensation of the water vapor occurs at, or near, atmospheric pressure and therefore the water vapor is at, or below, the saturation temperature of water at atmospheric pressure. Solar energy can be utilized to supply sufficient heat input to raise the temperature of large quantities of contaminated water to above the saturation temperature required in the vaporization process occurring in the evaporation chamber. The water vapor is then transferred to a condensation chamber where the pressure is at, or near, atmospheric pressure, hence less heat has to be removed from the water vapor to condense it, and the condensation step occurs quite rapidly. Once vaporized, the waver vapor and the dissolved solids are separated, and the vapor is condensed in a separate chamber, thereby substantially reducing the possibility of recontamination of the distillate with solids which have been removed from the cater by the distillation process. (Sinha-OEIS)
W81-01463

APPARATUS FOR DESALINATING WATER,
R. E. Diggs.
U.S. Patent No 4,199,406, 18 p, 21 Fig, 6 Ref; Official Gazette of the United States Patent Office, Vol 993, No 4, p 1359, April 22, 1980.

Descriptors: *Patents, *Desalination, *Desalination apparatus, *Solar radiation, Heat exchange, Separation techniques, Evaporation, Condensation, Equipment.

Contaminated water flows across a grid and into a storage tank. The grid utilizes solar energy to heat that water to a predetermined temperature. A heat transfer structure which is dome-shaped and receives water from the storage tank and a preheater utilizing solar energy heats the water to a further predetermined temperature. An evaporator receives the heated water and exposes it to a vacuum condition so that the temperature of the water is above the saturation temperature. The water is thus vaporized and dissolved solid contaminants are separated. The solids are deposited on moving belts and moved into a solids removal system. The solids removal system comprises trap door pairs upon which the solids are deposited and which are sequentially opened so that the vacuum conditions existing in the evaporator are not disturbed. The water vapor is removed and transfered to the heat transfer structure where it is condensed for form distillate. The distillate is transfered to a collection area. (Sinha-OEIS)
W81-01464

DEVELOPMENT OF COMPOSITE HOLLOW FIBERS--PHASE II,
Bend Research, Inc., OR.
W. C. Babcock, R. W. Baker, R. P. Barss, G. C. Corson, and B. A. Kruse-Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-161010, Price codes: A03 in paper copy, A01 in microfiche. Final Report to Office of Water Research and Technology, Sept. 15, 1980. 31 p, 13 Fig, 6 Tab, 11 Ref. OWRT-C-90261-D(No 9521)(1), 14-34-0001-9521.

Descriptors: *Membranes, *Desalination apparatus, Desalination processes, Reverse osmosis, Osmotic pressure, *Composite membranes, *Hollow fiber membranes, *Inside-skinned membranes, *Membrane modules, Hollow fiber modules.

The report describes the results of a program to develop inside-skinned, composite hollow fibers for brackish-water desalination by reverse osmosis. In a previous program, polysulfone hollow fibers were developed that have sufficient strength to withstand 400 psi internal pressure. During this program, minor improvements were made in the polysulfone fibers and a procedure was developed for reliably coating the lumen surfaces of the fibers with an NS-100 membrane. Modules containing several hundred fibers and having a combined membrane area of 1 sq ft exhibited rejections in excess of 90% and fluxes of 5 to 20 gfd at 400 psi with 0.5 wt% NaCl. The best module performance was 98.1% NaCl rejection and a flux of 13.4 gfd.
W81-01465

3B. Water Yield Improvement

PROJECT SKYWATER, DATA MANAGEMENT USERS GUIDE,
Water and Power Resources Service, Denver, CO. Office of Atmospheric Resources Management.
Report, July, 1980. 22 p, 4 Fig.

Descriptors: *Cloud seeding, *Water supply development, *Data collections, *Weather data, Weather modification, Data storage and retrieval, Meteorological data, Management, Precipitation(Atmospheric), Remote sensing.

Project Skywater is a comprehensive research program designed to develop additional water supplies by cloud seeding techniques. About 70% of the program is conducted through contracts with universities, private firms, and local, state, and Federal agencies. The various Skywater projects produce large quantities of data. Data sources include radar, satellite, rawinsondes, precipitation gages, cloud physics aircraft, and automated weather stations. Since 1975, thousands of computer tapes have been used to record data. To assure that high quality data are archived on the Skywater data base in a timely manner, data management influences must be applied throughout all phases of activities: development of request for proposal, contract, work plan, data collection, data processing, and archival. The objectives of data management are: to develop and maintain a Skywater data base management system with quality controlled, space-efficient archival techniques, and fast, simple retrieval procedures which are cost-effective and reliable, to maintain a current inventory of data collected and their archival status; and to provide data to analysts as requested. (Moore-SRC)
W81-01478

ANALYSIS OF DIGITIZED M-33 RADAR DATA FROM TEXAS HIPLEX, 1976-1978,
North American Weather Consultants, Salt Lake City, UT.
J. L. Sutherland, H. R. Swart, and D. A. Griffith.
Final Report, Volume 1 prepared for Texas Department of Water Resources, November, 1980. 85 p, 11 Fig, 22 Tab, 13 Ref. 14-0013.

Descriptors: *Texas, *Cloud seeding, *Radar, *Precipitation(Atmospheric), Weather modification, Clouds, Fronts(Atmospheric), Meteorological data, Data collections, Rainfall.

The Texas High Plains Experiment (HIPLEX) is a weather-oriented research effort intended to reduce the scientific uncertainties of beneficial and acceptable management of precipitation from summer cumulus clouds. Digitized M-33 radar data were analyzed to examine cloud seeding effects, produce an echo summary, generated hourly radar-derived rainfall maps, and determine environmental controls on echo occurrence. Possible seeding effects were detected in terms of increases in echo volume and area. Problems with radar data quality and a lack of randomization compromise the seeding analysis. A total of 11,207 echoes were detected. About 90% were convective cells, with warm-topped cells outnumbering coldtopped cells by two to one. About ten% of the echos were clusters (three or more reflectivity peaks). Fourteen line echoes were observed. In spite of their relative infrequence, lines were the dominant echo in terms of echo area, height, reflectivity and duration. Clusters were ranked next. Line echoes generally occurred with 500 mb troughs and along surface fronts. Clusters occurred under all weather patterns, although they were somewhat more frequent near (but not along) fronts. Days with cells only (no clusters or lines) were all non-frontal. Soundings near cells were relatively drier at all levels and also more unstable than soundings near clusters or lines. The mean top of the positive area deduced from soundings near lines was 75 mb greater (about 1 km lower) than the corresponding mean for cells. (Moore-SRC)
W81-01480

WATER SUPPLY PROBLEMS OF THE CITY OF MOSUL, AN EXTENSION OF THE ANCIENT CITY OF NINEVAH,
Mosul Univ. (Iraq). Coll. of Engineering.
For primary bibliographic entry see Field 3D.
W81-01570

3C. Use Of Water Of Impaired Quality

SEWAGE FARMING IN IRAQ: A POTENTIAL HAZARD FOR POLLUTION,
Environmental Pollution Research Center, Baghdad (Iraq).
S. M. Mutlak, Y. A. Hamdi, M. A. Nour, N. Bakal, and M. Al-Gazzaly.
Journal of Environmental Quality, Vol 9, No 4, p 677-680, October/December, 1980. 3 Fig, 2 Tab, 10 Ref.

Descriptors: *Sewage bacteria, *Irrigation practices, Coliforms, Aerobic bacteria, Irrigation, Sewage effluents, Liquid wastes, *Path of pollutants.

Microbial pollution problems associated with the use of raw sewage for agricultural purposes in Iraq are investigated. Composite samples of 10 individual surface and subsurface soil samples were taken from a sewage-irrigated farm near Baghdad. The soil was classed as fine silty. Some samples were incubated at 10 and 37C for 5 wk. Lettuce plants were obtained from the farm during a 9 wk period. Average total aerobic bacterial counts in different samples were 4000000 cells/g for surface and subsurface soils, and 450000000 cells/ml for sewage. Average counts of coliform were 400000 cells/g for surface and subsurface soils, and 3400000 cells/ml for sewage. The population of fecal streptococci was 6000 cells/g for surface soil, 4000 cells/g for subsurface soil and 17000 cells/ml for sewage. In general the sewage contained higher populations of total bacteria, coliforms and fecal streptococci than did the soils. Coliforms were present in the lettuce plants with an average of 4, 24, and 43 cells/g of tissue for the inner leaves, outer leaves, and head, respectively. These results indicate that the use of untreated sewage for agricultural purposes is hazardous and safety measures must be taken. (Baker-FRC)
W81-01528

URBAN AND AGRICULTURAL DEVELOPMENT: THE WASTE WATER ROLE,
For primary bibliographic entry see Field 5D.

W81-01640

3D. Conservation In Domestic and Municipal Use

WATER SUPPLY PROBLEMS OF THE CITY OF MOSUL, AN EXTENSION OF THE ANCIENT CITY OF NINEVAH,
Mosul Univ. (Iraq). Coll. of Engineering.
F. Y. R. Agha, T. A. Mahmoud, and S. Ahmad.
Water Supply and Management, Vol 4, No 3, p 129-137, 1980. 6 Fig, 3 Tab, 15 Ref.

Descriptors: *Water yield improvement, *Water supply development, *Water shortage, Water management(Applied), Water supply, Water allocation(Policy), Water rates, Water utilization, *Iraq, *Mosul(Iraq).

The city of Mosul (Iraq) has grown rapidly, and the existing water supply falls short of the demand particularly in the summer months. A study was conducted to identify the major factors which affect the present water supply, to estimate the future water requirements of the city, and to suggest ways and means to meet the city's water needs. Presently, water is withdrawn from the river, treated, and piped to the city. Population growth was estimated, and the overall water demand was estimated to increase at about 3% per year. The installation of a raw water supply system for watering lawns and public gardens, and attempts to eliminate waste and leaks, will reduce the demand for treated water. Proper metering and realistic pricing of treated water will help end waste. A third water treatment plant which will supply 198,000 cu m of treated water per day will be completed in 1980. But even with this new plant, Mosul demand will exceed the water supply by 1992. (Small-FRC)
W81-01570

3F. Conservation In Agriculture

IRRIGATION HOSE,
Sumitomo Chemical Co. Ltd., Osaka (Japan). (Assignee).
S. Kojimoto, T. Sato, J. Ono, T. Mori, and S. Suzuki.
U.S. Patent No 4,199,106, 8 p, 10 Fig, 7 Ref; Official Gazette of the United States Patent Office, Vol 993, No 4, p 1259, April 22, 1980.

Descriptors: *Patents, *Irrigation, *Application equipment, Hoses, Irrigation practices, Irrigation efficiency, *Drip irrigation.

An irrigation hose is produced by melt-sticking double thermoplastic resin film in a plane along longitudinal parallel lines so as to form two to three passages, one a supply passage and other being constant pressure passages. The supply passage is connected to each constant pressure passage by communicating holes which are formed by non-melt-stuck portions spaced in the melt-stuck line between both passages. The constant pressure passage has water-irrigating holes which are formed by non-melt-stuck portions spaced in an outside melt-stuck line. The improvement comprises making small melt-stuck portions in the vicinity of the communicating holes and/or water-irrigating holes. This assures uniform water-irrigation on both level and sloping fields. (Sinha-OEIS)
W81-01450

LOW VOLUME SPRAY DEVICE FOR SURFACE IRRIGATION SYSTEM,
Olson Irrigation Systems, Santee, CA. (Assignee).
D. Olson, and R. P. Georges.
U. S. Patent No 4,199,105, 4 p, 4 Fig, 5 Ref; Official Gazette of the United States Patent Office, Vol 993, No 4, p 1259, April 22, 1980.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, Application equipment, Irrigation practices, Irrigation efficiency, Nozzles.

A low volume spray device for irrigation systems has a lower tubular end portion that is beveled to facilitate its insertion into a plastic conduit. Its upper end forms a nozzle portion with a small orifice and a deflector that controls the spray pattern. The device is preferably molded from plastic material so as to be inexpensive yet long lasting. (Sinha-OEIS)
W81-01451

CONTROLLED THRUST, ROTARY, ADJUSTABLE TOPOGRAPHY SPRINKLER,
R. A. Rodriguez.
U.S. Patent No 4,198,001, 9 p, 11 Fig, 5 Ref; Official Gazette of the United States Patent Office, Vol 993, No 3, p 889, April 15, 1980.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, Application equipment, Irrigation practices, Irrigation efficiency, Nozzles.

This invention pertains to irrigation devices capable of varying their irrigation patterns. It achieves the desired effects through the use of only five major moving parts arranged about a central hollow cylindrical frame. Two parts comprise the main irrigation mechanism; a hollow rotary unit that holds a rotary nozzle, and the nozzle which is mounted on the rotary unit at a slight radial distance from its axis of ration and in a manner such that the irrigation jet thrust produces a rotating torque on the hollow rotary unit. Two other parts comprise the main mechanisms for harnessing and controlling the resultant force of irrigation jet and its induced torque, a torque buffing impeller and its connecting means to the rotary unit. An additional moving part, a nozzle rotation restrainer mounted on the hollow rotary units acts on the nozzle to restrain its rotation during particular motions. A fixed one piece adjustable contour plate consists essentially of the contour surface, which via a contact leg extending from the nozzle and riding on its surface its countour variations are transmitted into nozzle rotation. (Sinha-OEIS)
W81-01461

SOIL MOISTURE SAMPLER AND CONTROLLER,
J. D. Neal.
U.S. Patent No 4,197,866, 8 p, 2 Fig, 12 Ref; Official Gazette of the United States Patent Office, Vol 993, No 3, p 844, April 15, 1980.

Descriptors: *Patents, *Irrigation systems, *Soil moisture, Measurement, Automatic control, Electronic equipment, Temperature, Irrigation efficiency.

Periodically, the soil moisture sampler and controller automatically activates in-ground probe(s) to measure the soil moisture. The resulting output signal indicative of the soil moisture is adjusted for soil ambient temperature and compared to a pre-set soil moisture is less than a pre-set value, an irrigation timer is activated which causes the soil to be irrigated for a preselected time interval. (Sinha-OEIS)
W81-01462

IRRIGATION EFFICIENCY AND CONTROLLED ROOT-ZONE WETTING IN DEEP SANDS,
Florida Univ., Gainesville. Water Resources Research Center.
L. C. Hammond, R. S. Mansell, W. K. Robertson, J. T. Johnson, and H. M. Selim.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-161036, Price codes: A05 in paper copy, A01 in microfiche. Publication No 52, 1981. 80 p, 31 Fig, 26 Tab, 16 Ref, 1 Append. OWRT A-034-FLA(2), 14-34-0001-9010.

Descriptors: *Irrigation efficiency, *Deep sands, *Controlled root-zone wetting, Evapotranspiration, Drainage, Subsurface asphalt barrier, Sands, *Crop response, Irrigation practices, Corn, Soybeans, Peanuts, *Florida, Gainesville(FL), Live Oak(FL).

Ten field water management experiments were conducted with corn, soybeans and peanuts during 1977, 1978, and 1979 on well-drained sandy soils at Gainesville and Live Oak. Irrigation scheduling treatments varied from one to eight per experiment. A simple computer simulation model provided an estimate of seasonal evapotranspiration (ET), drainage, and change in soil storage. These data and calculated water use efficiencies served as a test of the effectiveness of various irrigation scheduling strategies, and provided information on crop response to water stress. Yields increased linearly with estimated ET. Regression of corn yields on estimated ET gave the following 3-year average results for Gainesville and Live Oak, respectively: $Y = 661X - 22{,}895$ ($R^2 = 0.90$), $Y = 471X - 12{,}964$ ($R^2 = 0.73$), where Y is grain yield, kg/ha-cm, and X is ET, cm. These findings were interpreted to mean that the most efficient crop production use of water is obtained when water is supplied to meet the full seasonal ET needs imposed by the atmosphere. In addition, a strategy of light, frequent irrigation of only the top 30 cm of sandy soils will produce high yields with minimum deep seepage loss of water and nutrients.
W81-01467

EFFECTS OF IRRIGATION REGIMES ON YIELD AND WATER USE OF SNAP BEAN (PHASEOLUS VULGARIS L.),
Georgia Coastal Plain Experiment Station, Tifton.
J. R. Stansell, and D. A. Smittle.
Journal of the American Society of Horticultural Science, Vol 105, No 6, p 869-873, November, 1980. 5 Fig, 6 Tab, 12 Ref.

Descriptors: *Irrigation efficiency, *Beans, *Evapotranspiration, Consumptive use, Irrigation effects, Soil moisture, Soil-water-plant relationships, Plant growth, Water requirements.

Two snap bean cultivars, Galagreen and Eagle, were grown as spring and fall crops in water-protected irrigation plots. Differences in water use were not significant in spring and fall crops (169 and 180 mm) or in cultivars (173 and 176 mm), but Eagle produced more than double the yield of Galagreen. Pod yield was greatest when beans were continually irrigated at a soil water tension of 25 kPa. Irrigation when soil water tensions reached 50 and 75 kPa reduced pod yields by 41 and 47% respectively. Snap beans were adversely affected by a water stress of 75 kPa at any one stage of growth: pre-bloom, bloom, and post-bloom. The most efficient water use was the 25 kPa treatment, which produced 0.62 MT per mm. Application of water at soil water tensions of 50 and 75 reduced water use efficiency by 27 and 35%. Daily evapotranspiration rates in mm were: 25 kPa treatment, $1.52 + 0.05x$ (where x is the age of the plant in days); 50 kPa treatment, $0.515 + 0.054x$; and 75 kPa treatment, $0.567 + 0.046x$. The mean daily rate of evaporation was 4.88 cm per day. Relationships of evapotranspiration to evaporation from an open pan were determined and can be used to accurately schedule irrigation. (Cassar-FRC)
W81-01523

FURROW EROSION AND SEDIMENT LOSSES ON IRRIGATED CROPLAND,
Science and Education Administration, Kimberly, ID. Snake River Conservation Research Center.
R. D. Berg, and D. L. Carter.
Journal of Soil and Water Conservation, Vol 35, No 6, p 267-270, November/December, 1980. 6 Fig, 2 Tab, 8 Ref.

Descriptors: *Erosion, *Channel erosion, *Furrow irrigation, *Irrigation ditches, *Sediment transport, Idaho, Slopes, Phosphorus, Sugar beets, Cereal crops, Alfalfa, Cultivated lands, Erosion control, Cover crops, Soil stabilization, Strip cropping, Irrigation practices, Water conveyance.

Between 0.2 and 63.0 tons per acre of sediment were lost during one irrigation season from furrow irrigation on 49 Idaho farms studied. Erosion was worst in fields planted with row crops and with slopes exceeding 1%. Cereal crops lost one-tenth the sediment compared with row crops, and alfalfa accumulated sediment. Phosphate losses generally followed sediment losses with a few fields losing

excessive amounts of phosphates. Surface runoff exceeded 30% in most fields, indicating that furrow stream inflow was excessive. Early season irrigation caused more erosion than later because plants and root systems stabilized the furrows. Erosion and phosphorus losses may be minimized by avoiding row crop irrigation on steeper slopes, controlling furrow stream size, keeping the tail-water ditch shallow, maintaining a vegetative filter strip (grasses, alfalfa, cereals), constructing sediment retention basins, irrigating every other furrow where possible, seeding crops directly in furrows, and using herbicides to reduce cultivation requirements. (Cassar-FRC)
W81-01538

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

FLOOD CONTROL OPERATIONS AND OPTIMIZATION: A CASE STUDY FOR BONNY RESERVOIR, COLORADO,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W81-01494

STORMWATER DETENTION BASINS MUST CONTROL MORE THAN RUNOFF,
Mosquito Extermination Commission, Morris County, NJ.
F. G. Schimmenti.
American City and County, Vol 95, No 12, p 41-42, December, 1980.

Descriptors: *Storage, *Storm runoff, *Urbanization, Design flow, Water pollution, Pondage, Settling basins, Storm water, Urban runoff, Design, Design criteria, Project planning, Engineering structures, Spillways, Overflow, Pipes, Weirs.

Various facilities have been designed to detain stormwater runoff to prevent property damage from flooding and erosion related to increased development. These facilities are in response to building regualtions which specify that runoff levels can not exceed those prior to construction. Such facilities include detention basins, ponds, and recharge basins, which can produce nuisance problems such as breeding mosquitoes and stagnant water. Designs for ponds or basins should incorporate components which provide for flow-through of fresh water, surface feeding fish, and a minimum water depth and slope. Outlet structures should be kept free of debris, be accessible for maintenance, and include an emergency spillway. (Titus-FRC)
W81-01527

4B. Groundwater Management

QUALITATIVE ASSESSMENT OF THE ECONOMIC IMPACTS OF A RISING WATER TABLE, LAS VEGAS, NEVADA,
Nevada Univ. System, Reno. Water Resources Center.
For primary bibliographic entry see Field 6B.
W81-01469

4C. Effects On Water Of Man's Non-Water Activities

DEFORESTATION AND INCREASED FLOODING OF THE UPPER AMAZON,
Missouri Botanical Garden, St. Louis.
A. H. Gentry, and J. Lopez-Parodi.
Science, Vol 210, No 4476, p 1354-1356, December, 1980. 1 Fig, 2 Tab, 20 Ref.

Descriptors: *Amazon River, *Surface runoff, *Floods, *Runoff, Forest watersheds, Water level fluctuations, Tropical regions, Annual flood, Watersheds(Basins), Drainage, Rain forests, Water levels, Peru, Iquitos(Peru), River basins, *Lumbering, Effects, Land use, Rivers, High water mark, Water balance, Low water mark.

Flood crests of the upper Amazon River measured at Iquitos, Peru, averaged 27.1 meters during 1970-1978, a significant increase compared to the 25.0 meters measured during the previous decade. Low water levels (approximately 19.5 meters average) and rainfall did not vary appreciably during this period. In fact, during 1978, a drought year, the high water level exceeded that of any year prior to 1970. The greater amount of runoff is believed to be a result of increased deforestation in the upper parts of the Amazon watershed in Peru and Ecuador. This demonstrates the noticable, perhaps irreversible, changes in water balance resulting from relatively limited forest destruction. (Cassar-FRC)
W81-01629

ON-SITE DISCHARGE SOLVES STORMWATER PROBLEMS,
Russell and Axon, St. Louis, MO.
A. Karaca.
Public Works, Vol 111, No 3, p 54-55, March, 1980. 2 Fig.

Descriptors: *Urbanization, *Storm runoff, *Storm drains, Floods, Subsurface discharge, *Flood control, Urban drainage, Ditches, Percolation, Watersheds, Penetration, Permeability, Groundwater, Water table, Piezometry, Illinois, Storage capacity, Economic feasibility, *Centerville(IL).

Some of the conditions causing flooding in the Matheson Manor Housing Complex, Centerville, Illinois, and the measures taken to correct the problem are discussed. Paving of farmland for the complex decreased natural drainage surfaces and soil absorptive surface area of the watershed. Flooding occurred under normal rainstorms, and drainage ditches experienced ponding followed by stagnation. Costs for the installation of sewer lines, pumps and outfall structures were considered to be too high, so the St. Clair County Housing Authority agreed on the construction of an underground discharge ditch to allow percolation of the runoff water through granular rock medium to the natural groundwater table. A pervious soil layer and sufficiently deep groundwater levels were important for successful operation of the ditch. Investigations were made to determine the feasibility of the proposed system by examining water table levels over the past 100 years. Subsurface tests were conducted to determine the penetration capacity of the soil. It was concluded that a 10-foot wide, 4-foot, 6-inch deep and 275-foot long trench with an 18-inch wide and 5-foot, 6-inch deep second trench at the midpoint of the trench bottom would satisfy the design criteria. Piezometric and visual measurements are scheduled to gather empirical data on this new method of stormwater discharge. (Geiger-FRC)
W81-01636

4D. Watershed Protection

EMPIRICAL STUDIES OF SOIL CONSERVATION TECHNIQUES AND DESIGN PROCEDURES,
Purdue Univ., Lafayette, IN.; and Science and Education Administration, Lafayette, IN.
W. C. Moldenhauer, and G. R. Foster.
In: Proceedings, International Conference on Soil Conservation, National College of Agricultural Engineering, Silsoe, Bedford, England, July 21-25, 1980, p 13-29, (1981). 54 Ref. Wiley Interscience.

Descriptors: *Soil erosion, Research techniques, *Rainfall, *Runoff, *Soil conservation, Erosion control, Research facilities, Reviews, Technology.

The main body of knowledge on soil conservation techniques and design procedures is from empirical studies. Soil conservation research is generally aimed at a better understanding of soil erosion and its control. Since complexity reduces almost all erosion research to some level of empiricism, clear identification of empirical studies is not possible. For this discussion, empirical studies are ones where data can be collected from plots and small watersheds to directly measure the influence of a major factor or factors on erosion as it might occur in typical field situations. Analytical and modelling analyses define the current level of knowledge, or more precisely what is not known. They provide clues to the sensitive parameters, provide guides for design of experiments, and give hints to interactions that are useful during data interpretation. Models suggest equation forms for more applied and field design procedures. Similarly, basic research provides identification and fundamental understanding of important erosion processes. Modelling and basic research should not be ignored as being inapplicable in an applied research programme. Natural runoff plots, small watersheds, rainfall simulators, laboratory tests, field tests, models, statistics, calculus, computers, tabulation sheets, theoretical studies, empirical studies, basic studies, applied studies, etc., are research tools. A well equipped mechanic has all of these in his tool chest and selects the ones that are most appropriate for the given task.
W81-01499

EFFECT OF CHISEL VERSUS MOLDBOARD PLOWING ON SOIL EROSION BY WATER,
Purdue Univ., Lafayette, IN. Agricultural Experiment Station; and Science and Education Administration, Lafayette, IN.
For primary bibliographic entry see Field 2J.
W81-01500

SOIL AND WATER LOSSES FROM CORN-SOYBEAN ROTATIONS,
Science and Education Administration, Ames, IA.
For primary bibliographic entry see Field 2J.
W81-01502

INFLUENCE OF SURFACE ROUGHNESS AND CLOD SIZE AND STABILITY ON SOIL AND WATER LOSSES,
Purdue Univ., Lafayette, IN.; and Science and Education Administration, Lafayette, IN.
C. B. Johnson, J. V. Mannering, and W. C. Moldenhauer.
Soil Science Society of America Journal, Vol 43, No 4, p 772-777, 1979. 6 Fig, 7 Tab, 11 Ref.

Descriptors: *Water loss, *Infiltration, *Surface roughness, Clod size, Compaction, *Soil erosion, Soil tilling, Soil types, Particle size, *Erosion control, *Compacted soils.

Rough cloddy surfaces increased infiltration and decreased soil erosion compared to smoother surfaces as determined by simulated rainfall studies. Overtilling reduced surface roughness and cloddiness. One field experiment showed that a rough surface decreased runoff by 77% and soil erosion by 89% of that from a smooth surface. Tillage of wet soil increased surface roughness, but another field experiment showed that clods resulting from plowing the soil when wet were quite unstable compared with clods from plowing nearer the upper plastic limit. Tilling of compacted soil results in greater cloddiness than tilling of uncompacted soils. However, a laboratory experiment showed that compacted loam clods were less resistant to breakdown by water drop energy than those from uncompacted soil. Compaction of silty clay loam and silty clay soils did not change their stability significantly. To be effective as an erosion control measure, soil clods must be large enough and stable enough to keep infiltration at a high level until the crop canopy covers the soil surface. These studies describe the size and stability necessary to maintain a high level of runoff and erosion control.
W81-01503

FURROW EROSION AND SEDIMENT LOSSES ON IRRIGATED CROPLAND,
Science and Education Administration, Kimberly, ID. Snake River Conservation Research Center.

For primary bibliographic entry see Field 3F.
W81-01538

A MODELING APPROACH TO WATERSHED CONSERVATION PLANNING,
Economics, Statistics, and Cooperatives Service, Broomall, PA.
C. W. Ogg, R. E. Heimlich, and J. E. Hostetler.
Journal of Soil and Water Conservation, Vol 35, No 6, p 271-273, November/December, 1980. 3 Tab, 6 Ref.

Descriptors: *Watershed management, *Erosion control, *Agricultural watersheds, Linear programming, Soil management, Mathematical models, *Model studies, Cultivated lands, Land management, Conservation, Agronomy, Agriculture, Adoption of practices, Farm management, Small watersheds, Contour farming, Cover crops, Terracing, Little Nottoway(VA), Virginia.

A linear programming model, developed for a cooperative river basin study, was applied to the Little Nottoway watershed, Virginia. This approach provides individual farm plans and a list of crops and farming practices producing maximum net revenue and consistent with watershed conservation. For example, knowing soil type, acreage, and erosion limits, the model can tell a farmer how many acres of which crops to plant using optimum methods such as contour, terrace, winter cover crop, or combinations of these, for maximum profit. This model can also help planners assess alternative erosion control plans and identify critical areas needing assistance. (Cassar-FRC)
W81-01539

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

EVALUATION AND APPLICATION OF DIALYSIS TITRATION TECHNIQUE FOR DETERMINATION OF COMPLEXING CAPACITY OF FRESHWATERS,
New Hampshire Univ., Durham. Dept. of Chemistry.
J. H. Weber, and R. E. Truitt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-161077, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Research Center, University of New Hampshire Completion Report, Research Report 32, January 1981. 38 p, 4 Tab, 74 Ref. OWRT-B-004-NH(6), 14-34-0001-8132.

Descriptors: *Dialysis, *Volumetric analysis, Freshwater, Analytical techniques, *Trace elements, *Copper, *Cadmium, Cations, Membrane processes, Separation techniques, Diffusion, Membrane, Evaluation, Testing, Ions, Water quality, Estimating, Instrumentation, Laboratory tests, Research and development.

The report is divided into two sections. The first section covers an evaluation of dialysis titration as a method for determining the complexing capacity (metal ion binding ability) of 10 mg/liter soil-derived fulvic acid (SFA) solutions. The complexing capacities of SFA for Cu(II) or Cd(II) were measured at pH 5, 6 and 7 during dialysis experiments, and were found to be greater for Cu(II) than Cd(II) at the same pH, and increased for both cations as pH increased. A comparison of dialysis and Cu(II) selective electrode results showed no inter-technique difference in their ability to measure complexing capacity. In the second section, seven New Hampshire freshwater samples having naturally-occurring ligands were tested for Cu(II) and Cd(II) binding by dialysis titration. The results were termed potential binding levels (PBL), and were 1.1-15.1 micromolar for Cu(II) and 0.0-9.7 micromolar for Cd(II). Correlations of alkalinity, pH, dissolved organic carbon, hardness, conductance, and UV absorbance to Cu(II) and Cd(II) PBL values show significant correlation (p,0.90) of Cu(II) with inorganic but not organic sample properties, while Cd(II) PBL values had no significant trends. (Zielinski-IPA)
W81-01471

PICLORAM IN WATER AND SOIL FROM A SEMIARID PINYON-JUNIPER WATERSHED,
Science and Education Administration, Tucson, AZ.
T. N. Johnsen, Jr.
Journal of Environmental Quality, Vol 9, No 4, p 601-605, October/December, 1980. 4 Fig, 1 Tab, 19 Ref.

Descriptors: *Picloram, *Herbicides, *Pollutant identification, Water quality, Soil contamination, Semiarid climates, 2,4-D, Watersheds, *Path of pollutants.

Residues of picloram were measured in runoff water and soil from a semiarid pinyon-juniper rangeland area located in north-central Arizona. The area had been treated with applications of 2.8 kg acid equivalent (ae) of picloram and 5.6 kg ae 2,4-D as the triisopropanolamine salts in 94 liters of water/ha laid by helicopter over 13 ha. Runoff samples were collected from 10 different areas and assayed for picloram with an electron capture gas chromatograph method sensitive to 0.4 ppbw (parts per billion, by weight) picloram in water. Soil samples were collected from 3 locations at 1, 10, 22, 32, 44, 57, and 69 mo after application. Composite soil samples were taken from depths of 0-8, 8-15, 15-30, 30-45, 45-60, 60-90, and 90-122 cm at each location. Soils were assayed by use of soybean assays for biological activity. The first runoff water samples contained the highest picloram concentration, 320 ppbw. The last detection of picloram in a water sample was at a concentration of 1 ppbw 35.5 mo after application. Picloram was last detected in soils collected 44 mo after treatment. One month after application, 92% of the herbicide recovered was in the surface 8 cm of the soil. Nine months later 66% of the picloram found was in the 90-122 cm depth. Further study suggested that in time small amounts of picloram might move to the soil surface by capillary action and be exposed to direct sunlight and thus destroyed during each wetting-drying cycle of the soil. (Baker-FRC)
W81-01521

EXTRACTION, SPECIATION, AND ANALYSIS OF ARSENIC AND ARSENICAL HERBICIDES IN RUNOFF: EVALUATION OF SIMPLE METHODS AT THE PPB LEVEL,
Southern Weed Science Lab., Stoneville, MS. Chemistry Dept.
For primary bibliographic entry see Field 5B.
W81-01530

SELECTED ORGANIC PESTICIDES, OCCURRENCE, TRANSFORMATION, AND REMOVAL FROM DOMESTIC WASTEWATER,
North Texas State Univ., Denton.
For primary bibliographic entry see Field 5D.
W81-01543

DETERMINATION OF PHOSPHORUS IN WASTE-WATERS BY INDUCTIVELY-COUPLED PLASMA ATOMIC EMISSION SPECTROMETRY,
Government Industrial Research Inst., Nagoya (Japan).
T. Ishizuka, K. Nakajima, and H. Sunahara.
Analytica Chimica Acta, Vol 121, p 197-203, December, 1980. 3 Fig, 4 Tab, 12 Ref.

Descriptors: *Waste water, *Phosphorus compounds, *Water analysis, Phosphorus, Phosphates, Spectrometry, Analytical techniques, *Pollutant identification.

Total phosphorus in waste waters was determined by inductively-coupled plasma-atomic emission spectrometry. The detection limits were 0.02, 0.04, and 0.11 micrograms per ml at the 213.618, 214.914, and 253.565 nanometer lines, respectively. Some interference was experienced with copper, but the following materials had negligible or small effect on the phosphorus determination at concentrations similar to those in waste water: Na, K, Ca, Mg, Cl, Al, Mn, Si, Ti, nitrate, sulfate, ammonium, dextrose and tartaric acid. Comparison of practical waste water samples analyzed by a standard method, the persulfate digestion-colorimetric method (molybdenum blue with ascorbic acid), and the method described in this paper showed good agreement between the methods. (Cassar-FRC)
W81-01611

AN EVALUATION OF DIFFERENTIAL PULSE ANODIC STRIPPING VOLTAMMETRY AT A ROTATING GLASSY CARBON ELECTRODE FOR THE DETERMINATION OF CADMIUM, COPPER, LEAD AND ZINC IN ANTARCTIC SNOW SAMPLES,
British Antarctic Survey, London (England).
M. P. Landy.
Analytica Chimica Acta, Vol 121, p 39-49, December, 1980. 1 Fig, 5 Tab, 25 Ref.

Descriptors: *Antarctica, *Metals, *Snow, *Path of pollutants, *Trace elements, Cadmium, Copper, Lead, Zinc, Analytical techniques, Water pollution sources, Adelaide Island, Polar regions.

Metals at sub ppb concentrations in Antarctic snow samples were determined without preconcentration by adapting differential pulse anodic stripping voltammetry at a rotating glassy electrode. In situ mercury plating gave better results than a permanent mercury film. Ultrapure water and rigorously cleaned vessels were essential. Low pH was maintained because under this condition the metals were more 'electrochemically available' and the rate of adsorption of metals onto the container was minimized. Samples of snow were collected on Adelaide Island to determine the relationship between metal concentration and source (a British base, the sea, and rock exposures). Zinc samples were taken, but container contamination caused results to be inconclusive. Levels of Cd, Cu, and Pb, averaged 0.37 + or - 0.30, less than 0.47 + or - 0.47, and 0.82 + or - 0.65 respectively on samples taken on a 30.9 km traverse north from the base. Samples 52 km from the base averaged about 0.10, suggesting anthropogenic origin. On a 14.4 km traverse from the sea, levels of Cd, Cu, and Pb (0.14 + or - 0.2, less than 0.08 + or - 0.11, and 0.20 + or - 0.24, respectively) approached the sample background level for remote areas. Metal content of snow samples taken near exposed rock indicated that local geology and wind direction and strength strongly affected metal distribution. (Cassar-FRC)
W81-01612

THE DETERMINATION OF ARSENIC BY ELECTROTHERMAL ATOMIC ABSORPTION SPECTROMETRY WITH A GRAPHITE FURNACE, PART 2. DETERMINATION OF ARSENIC(III) AND ARSENIC(V) AFTER EXTRACTION,
Antwerp Univ., Wilrijk (Belgium). Dept. of Chemistry.
D. Chakraborti, W. DeJonghe, and F. Adams.
Analytica Chimica Acta, Vol 120, p 121-127, November, 1980. 1 Fig, 3 Tab, 22 Ref.

Descriptors: *Arsenic compounds, *Analytical techniques, Pollutant identification, Water analysis, *Spectroscopy, Natural waters, Instrumentation.

Arsenite and arsenate can be sequentially determined in fresh and sea water samples by extraction and atomic absorption spectrometry. This method shows recoveries of greater than 90% and has a detection limit of 6 ng per liter. A 500 or 1000 ml sample is extracted with HCl and ammonium butyl dithiophosphate-hexane solution. Arsenic(3+) is then present in the organic layer; arsenic(5+), in the aqueous layer. After treatment of the aqueous layer with a reducing agent, sodium hydrogen sulfite-sodium thiosulfate solution, the previous extraction procedure is used and the now-reduced arsenic(5+) obtained in the organic layer. The latter is extracted with bromine water and reacted with nitric acid, hydrogen peroxide, and nickel sulfate solution. Samples are compared with stand-

ards using graphite furnace atomic absorption spectrometry. Interference from K, Al, Na, SO4, and other cations and anions is eliminated using this extraction reagent. (Cassar-FRC)
W81-01613

CHEMICAL SPECIATION OF MERCURY IN NATURAL WATERS,
National Water Research Inst., Burlington (Ontario).
P. D. Goulden, and D. H. J. Anthony.
Analytica Chimica Acta, Vol 120, p 129-139, November, 1980. 4 Fig, 3 Tab, 9 Ref.

Descriptors: *Mercury, *Water analysis, Analytical techniques, *Pollutant identification, Chemical properties, Path of pollutants, *Speciation, Ecosystems.

Speciation of mercury forms in environmental samples is of interest in order to determine the routes by which mercury passes through the ecosystem and because of the differing toxicities of the varying forms. Three species of mercury (inorganic, aryl mercury compounds, and alkyl mercury compounds) can be differentiated and determined in natural waters by improving the sensitivity of the cold vapor atomic absorption method. The detection limit has been lowered from 0.001 micrograms per liter to 1 nanogram per liter by partitioning at 90C and measuring absorbance at room temperature. Total mercury is determined in the mechanized system by digesting the sample, first to inorganic mercury, then to elemental mercury, which is measured by absorbance. Speciation is accomplished by treating with reducing agents; EDTA-water with hydroxylamine in alkaline solution reduces inorganic compounds to mercury; and CdCl2 and SnCl2 reduces all forms to mercury. (Cassar-FRC)
W81-01614

GAS CHROMATOGRAPHIC METHOD FOR THE DETERMINATION OF SELENITE AND TOTAL SELENIUM IN SEA WATER,
Southampton Univ. (England). Dept. of Oceanography.
C. I. Measures, and J. D. Burton.
Analytica Chimica Acta, Vol 120, p 177-186, November, 1980. 3 Fig, 6 Tab, 21 Ref.

Descriptors: *Selenium, *Sea water, *Pollutant identification, Analytical techniques, Water analysis, *Gas chromatography, Chemical properties.

A method for routine determination of selenite and total selenium in sea water uses oxidation under controlled pH, extraction with toluene, and gas chromatography with an electron capture detector. Selenite reacts with 4-nitro-o-phenylenediamine at pH less than 1.8 to form 5-nitropiazselenol. A single toluene extraction yielded 80% recovery. Therefore, standards are prepared from known selenium solutions. Total selenium is determined by photo-oxidation of the sample, which has been mixed with borax and hydrogen peroxide. After this step, the selenite oxidation procedure converts the remainder of the selenium to the piazselenol. None of the ions studied (nitrate, nitrite, phosphate, silica, V(5+), Cr(3+), Cr(6+), Mn(2+), or Mn(4+)) interfered at concentrations 10 to 100 times normal sea water levels. Detection limit for this method is 10 pmol per liter. (Cassar-FRC)
W81-01615

AUTOMATIC DETERMINATION OF INORGANIC CARBON IN SURFACE WATERS,
Ontario Ministry of the Environment, Rexdale.
J. Crowther, and W. B. Moody.
Analytical Chimica Acta, Vol 120, p 305-311, November, 1980. 2 Fig, 2 Tab, 5 Ref.

Descriptors: *Carbon dioxide, *Acidic water, *Pollutant identification, Analytical techniques, Carbon, *Inorganic carbon, Acidity, Surface waters, Chemistry of precipitation, Water sources, Colorimetry.

An automated colorimetric procedure was developed for determination of dissolved inorganic carbon equilibria products in waters. This method, useful in studies of acid rains and waters, can handle concentrations in high and low ranges, 0.3-40.0 mg per liter and 0.01 to 2.00 mg per liter. For the high analytical range the sample was acidified to convert products to carbon dioxide. Then the stream was mixed with CO2-free air, passed over a gas dialyzer with a CO2-permeable membrane. Carbon was determined by measuring the loss in absorbance in a weakly buffered alkaline phenolphthalein solution at 550 nm. For the low range of concentration, an extra gas dialyzer and heating bath set at 60C were added and flow rates changed. Results are valid if samples are protected from the atmosphere. Interferences were limited to sulfide, which was detected as inorganic carbon. Eight common cations and 7 common anions, humic acid, and tannic acid did not interfere. (Cassar-FRC)
W81-01617

DETERMINATION OF TRACES OF PHENOL IN WATERS BY MOLECULAR EMISSION CAVITY ANALYSIS,
Ibadan Univ. (Nigeria). Dept. of Chemistry.
O. Osibanjo, and S. O. Ajayi.
Analytica Chimica Acta, Vol 120, p 371-375, November, 1980. 1 Fig, 3 Tab, 16 Ref.

Descriptors: *Phenols, *Analytical techniques, Aromatic compounds, *Pollutant identification, Water analysis, Molecular emission cavity analysis, Atomic absorption-emission spectoscopy.

Traces of phenol were determined in natural waters by adapting a flame atomic absorption/emission spectrophotmeter for molecular emission cavity analysis. The equipment was modified by assembling an indium-coated steel cavity. Water samples were treated with acetic acid and liquid bromine to form the tribromo derivative. This precipitate was dissolved in ethanol, injected into the cavity, and the InBr emission obtained on igniting the flame measured at 376 nm. A graph was prepared for phenol over the range 0.000005 to 0.00015 moles. Although the low levels of chloride, iodide, nitrate, sulfate, and phosphate ions found in surface waters do not interfere with the determination, high levels of phosphate, chloride, and iodide should be previously removed with silver sulfate. Nitrate can be reduced to nitrite and removed with sulfamic acid. Recoveries of 98% phenol were obtained using this method to analyze lake waters. (Cassar-FRC)
W81-01618

MOLECULAR EMISSION CAVITY ANALYSIS, PART 18. DETERMINATION OF SOLUBLE SULPHATE IN WATERS, SOIL, DUSTS, AND OTHER SAMPLES,
Birmingham Univ. (England). Dept. of Chemistry.
T. S. Al-Ghabsha, S. L. Bogdanski, and A. Townshend.
Analytica Chimica Acta, Vol 120, p 383-387, November, 1980. 3 Tab, 11 Ref.

Descriptors: *Sulfates, *Water analysis, *Soil analysis, Sulfur compounds, Analytical techniques, *Pollutant identification, Molecular emission cavity analysis, Atomic absorption-emission spectroscopy.

Water-soluble sulfates in samples of water, soil, and dusts were determined by a simple, quick, accurate method which does not involve precipitation. After digestion of the sample in water, the particulates were filtered out and the water concentrated by boiling. After addition of phosphoric acid, the solution was injected into a cold stainless steel cavity for measurement by molecular emission cavity analysis. Emission intensity at 384 nm was recorded as a function of time. Comparison with nephelometric and gravimetric methods showed good agreement. (Cassar-FRC)
W81-01619

DETERMINATION OF CYANIDE IN THE PRESENCE OF MERCAPTANS WITH A SELECTIVE-ELECTRODE,
Pardo de la Magdelena, Valladolid (Spain). Dept. of Analytical Chemistry.
J. L. Bernal, R. Pardo, and J. M. Rodriguez.
Analytica Chimica Acta, Vol 120, p 367-370, November, 1980. 2 Tab, 10 Ref.

Descriptors: *Cyanide, *Sulfur compounds, *Mercaptans, Water analysis, Analytical techniques, Waste water, Industrial wastes, *Pollutant identification, Electrometry, Ion-selective electrodes.

Interference of mercaptans in determination of cyanide in waste waters by the cyanide-selective electrode is eliminated by oxidation or oxidation-distillation treatments. The oxidation method, which detects only free cyanide, uses TISAB solution and hydrogen peroxide prior to electrode determination of cyanide ion. The oxidation-distillation method, which breaks down complexes and detects total cyanide ion, follows the oxidation treatment with addition of mercuric chloride, magnesium chloride, and sulfuric acid and distillation of hydrogen cyanide for a period of 50 minutes. Cyanide ion is determined with the electrode as before. (Cassar-FRC)
W81-01620

AN IMPROVED FLOW INJECTION DETERMINATION OF NITRITE IN WATERS BY USING INTERMITTENT FLOWS,
Centro de Energia Nuclear na Agricultura, Sao Paulo (Brazil).
E. A. G. Zagatto, A. O. Jacintho, J. Mortatti, and H. Bergamin.
Analytica Chimica Acta, Vol 120, p 399-403, November, 1980. 3 Fig, 1 Tab, 9 Ref.

Descriptors: *Nitrites, *Waste water, *Water analysis, Nitrogen compounds, Analytical techniques, *Pollutant identification, Instrumentation, Flow injection analysis, Spectroscopy.

A routine spectrophotometric method for determination of nitrites in waste waters uses an injector-commutator with a 0:1:2 section, which achieves intermittent flows without intermittent pumping. The merging zones approach is used to reduce consumption of reagents. With this method, 70 samples can be run hourly compared with 55 samples per hour without intermittent flow. Precision is 0.5% relative to a 60 ppb nitrite water sample. (Cassar-FRC)
W81-01621

A SIMPLE AND RAPID METHOD OF COLLECTING RADIONUCLIDES FROM RAIN WATER,
Chemical Analysis Center, Chiba (Japan).
T. Kimura, and T. Hamada.
Analytica Chimica Acta, Vol 120, p 419-422, November, 1980. 1 Fig, 2 Tab, 4 Ref.

Descriptors: *Rain water, *Strontium radioisotopes, Radionuclides, Water analysis, Fallout, *Radioisotopes, Nuclear explosions, Ion exchange resins, Sampling, Gamma rays, Pollution.

Radionuclides in rain water were concentrated by passing 10-liter samples through ion exchange resin columns. One method involved filtering the rain water sample, passing the filtrate through the resin column, evaporating the effluent to about 15 ml, and determining the gamma-emitters in filter, resin, and effluent by X-ray spectrometry. A second method used Powdex ion exchange resin treated with precoating material. Strontium solution was added to the sample as a carrier. After elution, radiostrontium was measured with a beta-ray spectrometer and total strontium by atomic absorption spectrometry. In Method 1, Zr95, Ce141, and Ce144 were collected on the filter paper; Be7 and Cs137 on the resin. A little Zr95, Ba140, and Ce144 were found in the effluent. In Method 2 almost all the gamma-emitters were found in the resin, little in the effluent. Recovery of strontium ions from the resin ranged between 75-90%. (Cassar-FRC)
W81-01622

QUANTITATIVE DETERMINATION OF MIREX AND ITS DEGRADATION PRODUCTS BY HIGH-RESOLUTION CAPILLARY GAS

Group 5A—Identification Of Pollutants

CHROMATOGRAPHY/MASS SPECTROMETRY,
Canada Centre for Inland Waters, Burlington (Ontario).
F. I. Onuska, M. E. Comba, and J. A. Coburn.
Analytical Chemistry, Vol 52, No 14, p 2272-2275, December, 1980. 3 Fig, 4 Tab, 10 Ref.

Descriptors: *Mirex, *Analytical techniques, *Pollutant identification, *Pesticide residues, Fish, Trout, Aquatic animals, Lampreys, Gas chromatography, Mass spectrometry, Lake Ontario, Niagara River.

Mirex and its environmental degradation products in samples of fish and suspended sediments from Lake Ontario and the Niagara River were determined by mass spectrometry using their electron impact ionization mass spectra. These results were compared with analysis by electron capture gas chromatography. Single ion monitoring for the selected ions m/z 546 and m/z 272 and multiple ion detection using four preselected ions showed insignificant statistical differences when compared with each other and the gas chromatography method. The single ion detection procedure monitoring ion m/z 272 was suggested as a rapid, sensitive method for determination of mirex. Ten trout samples contained between 75 and 330 picograms per microliter. Five lamprey samples averaged 14-17 picograms per microliter; the two sediment samples, 268 and 755 picograms per liter. (Cassar-FRC)
W81-01623

DETERMINATION OF TRACE ELEMENTS IN SEA WATER BY INDUCTIVELY-COUPLED PLASMA EMISSION SPECTROMETRY,
Takaishi City Environmental Pollution Control Center, Osaka (Japan).
A. Sugimae.
Analytica Chimica Acta, Vol 121, p 331-336, December, 1980. 3 Tab, 16 Ref.

Descriptors: *Trace elements, *Sea water, *Water analysis, Metals, *Pollutant identification, Analytical techniques, Lead, Manganese, Cadmium, Nickel, Zinc, Iron, Vanadium, Copper, *Spectrophotometry, Atomic absorption-emission.

Inductively-coupled plasma emission spectrometry has been applied to detection of trace elements in sea water without interference from the high levels of Na, Mg, and Ca present. Complexes of the trace metals (Pb, Zn, Cd, Ni, Mn, Fe, V, and Cu) with sodium diethyldithiocarbamate are extracted with chloroform. Before nebulization, the extract is evaporated to dryness, treated with hydrochloric acid and nitric acid, evaporated again, and dissolved in distilled water. Recoveries of trace elements examined were 97-99%, with the exception of V (83 + or - 5%). Detection limits for one-liter samples in micrograms per liter are as follows: Mn, 0.063; Zn, 0.13; Cd, 0.25; Fe, 0.25; V, 0.38; Ni, 0.5; Cu, 0.5; and Pb, 2.5. (Cassar-FRC)
W81-01624

PURGE VESSEL DESIGN IN DETERMINATIONS OF VOLATILE ORGANIC COMPOUNDS,
Dow Chemical Co., Midland, MI.
T. Ramstad, and T. J. Nestrick.
Analytica Chimica Acta, Vol 121, p 345-348, December, 1980. 1 Fig, 3 Ref.

Descriptors: *Organic compounds, *Water analysis, *Purge vessels, Volatile organics, Instrumentation, Waste water, *Pollutant identification, Volatility.

Five purge vessels for determination of volatile organic compounds in aqueous systems are described and illustrated. The Bellar and Lichtenberg (B and L) vessel is waterjacketed and fitted with an antifoam device. Sample capacity is 10 cu cm. Detection limits are sub ppb. The Mini B and L is useful where sample size is limited, where shortened purge time is important, and in analysis of industrial waste streams. The Mini B and L with foam trap is useful for samples 1.5 cu cm or less which foam. The packed purge vessel completely suppresses servere foaming and supplies high purging efficiency. The particulate purge vessel can determine volatile organics in sediments, soils, and sludges. (Cassar-FRC)
W81-01625

THE D.C. POLAROGRAPHIC DETERMINATION OF TRACES OF HUMIC SUBSTANCES IN POTABLE WATERS (SPURENANALYSE VON HUMINSTOFFEN IM TRINKWASSER),
Academie der Wissenschaften der DDR, Leipzig. Forschungsstelle fuer Chemische Toxikologie.
H. Sohr, and K. Wienhold.
Analytica Chimica Acta, Vol 121, p 309-314, December, 1980. 3 Fig, 9 Ref. (English summary).

Descriptors: *Humic acids, *Potable water, *Fulvic acids, Organic acids, Analytical techniques, Water analysis, *Pollutant identification, Polarography.

Humic substances reduce the inhibitory effect of a tri-n-butylphosphate layer absorbed at the mercury drop on the polarographic wave of copper (II). This effect can be used to measure humic substances in drinking water in the range 0.05 to 1 mg per liter. This method does not differentiate between humic and fulvic acids. Amino acids, peptides, and polyhydroxy compounds do not interfere. A reference compound isolated from peat bog water was used. (Cassar-FRC)
W81-01626

SAMPLING: DEFINING THE TASK AND PLANNING THE SCHEME,
Water Research Centre, Marlow (England). Medmenham Lab.
For primary bibliographic entry see Field 7A.
W81-01627

SAMPLING OF WATER AND WASTE WATER: PRACTICAL ASPECTS OF SAMPLE COLLECTION,
Severn-trent Water Authority (England). Avon Div.
T. Schofield.
Water Pollution Control, Vol 79, No 4, p 468-476, November, 1980. 1 Tab, 4 Ref, Append.

Descriptors: Sampling, *Water sampling, *Water pollution, *Water quality, Data collections, Monitoring, Measurement, Equipment, Waste water(Pollution), Streamflow, Flow rates, *Water analysis, Methodology.

Practical suggestions for reliable collection of water and waste water samples are discussed. A thorough understanding of the system and sites (continuous vs. batch, two-phase liquids, changes in river flow, etc.) is necessary for effective sample collection. The nature of discrete and composite samples is described. Composite samples may include time-interval, flow-proportional, sequential, and continuous. Proper sample size, handling, labeling, and preservation of stability are emphasized. Automatic sampling methods are briefly discussed. Properties and advantages of commercial instruments available for automatic sampling are compared in a table. (Cassar-FRC)
W81-01628

5B. Sources Of Pollution

INVESTIGATION INTO EFFLUENT DISCHARGES FROM WASHINGTON FRESH APPLE PACKERS, VOLUMES I AND II,
SCS Engineers, Long Beach, CA.
J. Vuceta, R. Marsh, K. LaConde, and T. Dong.
Report, September 17, 1980. Vol 1 - 110 p, Vol 2 - 82 p, 23 Fig, 16 Tab, 153 Ref, 4 Append. EPA 68-03-2578.

Descriptors: *Washington, *Pre-treatment(Water), *Water sampling, *Adsorption, *Apples, Orchards, Laboratory tests, Chemical degradation, Chemical properties, Biomass, Activated sludge, Filtration, Groundwater, Apple packing industry, Effluents, Storage, Preservation, Chemicals.

Disposal practices and pretreatment technology were investigated for four chemicals---diphenylamine (DPA), sodium orthophenylphenate (SOPP), benomyl, and thiabendazole (TBZ)---utilized by Washington State fresh apple packers. Samples of effluent streams, in-process batch solutions, and groundwater were analyzed. A laboratory-scale activated sludge (AS) unit was used to evaluate each chemical. Carbon adsorption, coagulation, filtration, ion exchange, and chemical pretreatment technologies were evaluated. Theoretical degradation products of all four chemicals were assessed. DPA upset the AS unit under slug load conditions at 100 ppm. None of the other chemicals exhibited toxic effects. Activated carbon adsorption appeared to be the most effective pretreatment technology in terms of removal efficiencies; mixed-media filtration, the least effective. Very little published information was found relative to degradation products of DPA and SOPP, while the published information on benomyl and TBZ was found to be more extensive. The possible degradation pathways of each were thus developed, based also on their similarity with other applicable organics. It was concluded that the catabolic and metabolic pathways of all four chemicals are not well understood. Volume II, the appendices, contains detailed descriptions of the analytical techniques used during this study. (Author's abstract)
W81-01431

STATE OF WASHINGTON INDUSTRIAL WASTE SURVEY.
URS Co., Seattle, WA.
For primary bibliographic entry see Field 5D.
W81-01434

IMPACT OF URBAN STORM RUNOFF ON STREAM QUALITY NEAR ATLANTA, GEORGIA,
Geological Survey, Doraville, GA. Water Resources Div.
J. B. McConnell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-142473, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/2-80-094, August 1980. 64 p, 11 Fig, 15 Tab, 13 Ref. EPA-IAG-D6-0137.

Descriptors: *Urban runoff, *Storm water, *Streams, *Water quality, Storm runoff, Thunderstorms, Dry seasons, Water pollution, Georgia, Summer, Autumn, Coliforms, Biochemical oxygen demand, Dissolved oxygen, Trace elements, Waste treatment, Low flow, Reservoir releases, Atlanta area(GA).

The objective of this study was to assess the impact of stormwater runoff from point and nonpoint sources on the water quality of receiving streams in the Atlanta area. Emphasis was placed on the collection of water-quality data in the summer and autumn to determine the impact on streams from runoff produced by thunderstorms during the dry-weather seasons. Compared to dry-weather flow, stormwater runoff significantly increased the average concentration of suspended sediment, BOD 5, total organic carbon, total ammonia nitrogen, total phosphorus, fecal coliform bacteria, and trace metals in most receiving streams in the Atlanta Metropolitan Area. Stormwater runoff increased the mean concentration of most constituents 2- to 5-fold. In most streams, the dissolved-oxygen concentrations generally increased to near saturation during periods of stormwater runoff. The dissolved-oxygen concentration in the Chattahoochee River near Fairburn during a period of low flow reached a low of 1.5 milligrams per liter (a 4-milligram per liter decrease) as a result of runoff from a July thunderstorm. However, low flow during the summer and autumn occurs only about 21% of the time due to flow regulation of the river. The flushing and dilution effect of water released for power generation caused a significant improvement in Chattahoochee River quality most of the time. (Author's abstract)
W81-01439

PHYSICAL CHEMISTRY OF VIRUS ADSORPTION AND DEGRADATION ON INORGANIC SURFACES: ITS RELATION TO WASTE WATER TREATMENT,
Stanford Univ., CA.
J. P. Murray.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-112872, Price codes: A05 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/2-80-134, August, 1980. 78 p, 14 Fig, 16 Tab, 78 Ref. R-805016.

Descriptors: *Viruses, *Adsorption, *Waste water treatment, *Physicochemical properties, Aluminum, Chemical properties, Theoretical analysis, Chemical degradation, Disinfection, Environmental sanitation, Water treatment, Public health.

Using poliovirus type 1 as a model enterovirus, it was established with a wide range of materials that adsorption is controlled by the balance between electrostatic double layer interactions and electrodynamic Van der Waals interactions. This control was demonstrated by showing that adsorption free energies calculated from mass action arguments are in good agreement with adsorption potentials calculated from the DLVO-Lifshitz theory of colloid stability. Since this enterovirus is quite characteristic of enteroviruses in size, geometry, electrokinetic properties, and survival in the environment, these studies should be representative of enteroviruses in general. Some solids, most notably aluminum metal, degrade virus during adsorption. When information gained in mechanism and degradation studies was applied to a bench scale system with a 1 cm bed of aluminum and 0.7 min residence time, it was found that aluminum metal removes more than 99% of the input virus titer from secondary effluent at steady-state. Aluminum metal is substantially more effective than granular activated carbon for the purpose of virus removal, and has good potential for eventual use in advanced water and waste water treatment systems. The DLVO-Lifshitz theory provides a fundamental, organized frame of reference in which to understand virus adsorption, and allows prediction of the types of materials and solution conditions conducive to virus adsorption and those that are not. (Moore-SRC)
W81-01441

AN EVALUATION OF NONPOINT SOURCES OF PESTICIDE POLLUTION IN RUNOFF,
North Carolina State Univ. at Raleigh. Dept. of Crop Science.
J. B. Weber, P. J. Shea, and H. J. Strek.
In: Environmental Impact of Nonpoint Source Pollution, 1980, p 69-98. 4 Tab, 51 Ref. Ann Arbor Science Publishers Inc., Ann Arbor, Michigan. OWRT-B-122-NC(4).

Descriptors: *Agricultural runoff, *Rainfall-runoff relationships, *Pesticide drift, Research priorities, *Agricultural chemicals, Rainfall intensity, Runoff, Agriculture, Surface runoff, Surface waters, Pesticides, Planning, Evaluation, Chemicals, Chlorinated hydrocarbon pesticides, Pesticide removal, Poisons, Toxins, Rain, Hazards, Deposition(Pesticides), Residues, Research and development, *Path of pollutants.

The amount of field-applied pesticide runoff into streams depends primarily upon the intensity and duration of rainfall, and the length of time between pesticide application and rainfall occurrence. The objectives of this study were to (1) evaluate the amounts and hazards of pesticides in runoff from agricultural lands, and (2) discuss and evaluate the types of research being carried out to measure this phenomenon. In spite of efforts to measure, model, and modify pesticide runoff from agricultural lands, few new practical developments have resulted since the inception of soil conservation practices recommended over 40 years ago. Pesticide losses to agricultural runoff in long-term studies average 1-2%; while losses under the most 'castastrophic' rainfall condtions averaged about 7% - values comparable to fertilizer nutrient losses in runoff. Hence, sound soil management and conservation practices are applicable for controlling pesticide runoff. Nonetheless, owing to the increased disposal of municipal sludges on agricultrual lands, the use of models to study/predict toxic sludge chemical runoff is encouraged. (Zielinski-IPA)
W81-01474

FATE OF POLYCHLORINATED BIPHENYLS (PCBS) IN SOIL-PLANT SYSTEMS,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
D. Pal, J. B. Weber, and M. R. Overcash.
Residue Reviews, Vol 74, p 45-98, 1980, 20 Fig, 14 Tab, 79 Ref. OWRT-B-122-NC(3).

Descriptors: *Polychlorinated biphenyls, *Soil-water-plant relationships, *Pesticide residues, *Path of pollutants, *Chemical degradation, Chemical analysis, PCB, Aroclors, Chlorinated hydrocarbon pesticides, Pollutant indentification, Pollutants, Soil chemistry, Soil contamination, Soil science, Environment, Environmental control, Soil dynamics, Plant physiology, Hazards, Deposition(Pesticides), Residues, Research and development, Kinetics, Public Health.

This review has evaluated the decomposition and stability of PCBs in soil-plant environments. Assessment was made of the phenomena of plant uptake and accumulation of PCBs, under various growth conditions, and their metabolites in the different parts of plants. Specifically highlighted were the problems of agronomic implications and practices in a society where waste PCBs may be managed by land application at assimilative rates that are safe and economically acceptable. Factors influencing the behavior and fate of PCBs in soils and in crops of agronomic importance have been developed, and a conceptual flow diagram is presented. PCBs decompose in soil system, probably faster than in any other waste management alternative or receiver system involving biological activity. Four areas for future research were identified based on observed major drawbacks in existing data: (1) study of properties of individual PCBs instead of commercial preparations; (2) crop/soil studies with PCBs having four or more chlorine atoms; (3) need for partition coefficient data (soil-water; water-air; air-plant; during flow in the food chain); (4) need for reliable data (e.g., volatization, photodecomposition and water-related transport). (Zielinski-IPA)
W81-01475

A SURVEY OF PATHOGEN SURVIVAL DURING MUNICIPAL SOLID WASTE AND MANURE TREATMENT PROCESSES,
Ebon Research Systems, Washington, DC.
S. A. Ware.
Environmental Protection Agency Report EPA-600/8-80-034, August, 1980. 115 p, 13 Fig, 26 Tab, 121 Ref. 2 Append. 68-03-2460-5.

Descriptors: *Municipal wastes, *Farm wastes, *Waste treatment, Pathogenic fungi, *Pathogenic bacteria, Animal parasites, Viruses, Water pollution sources, Microorganisms, Public Health, Solid wastes, Environmental sanitation, Incineration, Landfills, Anaerobic digestion, Composting.

Municipal solid waste (MSW) and animal manure may contain microorganisms that cause disease in man and animals. These pathogenic microorganisms include enteric bacteria, fungi, viruses, and human and animal parasites. Composting appears to be an effective method of destroying pathogenic organisms provided that sufficient times and temperatures are achieved. The extent to which microorganisms are destroyed during incineration is a function of both the design and the manner of operation of the incinerator. All pathogens should be destroyed provided that the entire solid waste charge quickly reaches an appropriate temperature. There is a possibility that pathogenic bacteria and viruses may survive conditions within sanitary landfills, and may be leached to ground or surface water. There appears to be a significant decrease in viral and bacterial content of leachate with time of operation or leaching of the fill. The chemical and physical characteristics of the leachate also contribute toward both viral and bacterial inactivation. No studies were available on pathogen survival in anaerobically digested MSW, but studies of digested sewage sludge have shown survival of pathogenic organisms. It appears that prolonged survival of some of the more common pathogens present in animal wastes is possible within the oxidation ditch environment. High gradient magnetic separation and gama radiation sterilization are future options, especially for animal waste management. (Moore-SRC)
W81-01483

A REMOTE SENSING TECHNIQUE TO MONITOR CLADOPHORA IN THE GREAT LAKES,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 7B.
W81-01486

ENVIRONMENTAL EFFECTS OF WESTERN COAL COMBUSTION: PART III-THE WATER QUALITY OF ROSEBUD CREEK, MONTANA,
Colorado State Univ., Fort Collins. Dept. of Chemistry.
R. K. Skogerboe, M. M. Miller, D. L. Dick, R. V. Thurston, and R. C. Russo.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-113615, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/3-80-071, July, 1980. 68 p, 23 Fig, 9 Tab, 38 Ref. R803950.

Descriptors: *Water quality, *Air pollution, *Powerplants, Smoke, *Snowmelt, Streams, *Coal, Montana, Arsenic, Mercury, Coal mines, Runoff, Heavy metals, Water pollution, Sediments, Chemical precipitation, Alkaline water, *Rosebud Creek(MT).

Rosebud Creek is the major surface drainage immediately east of the powerplant at Colstrip, Montana. This study was begun in October of 1975, about two months before initiation of power generation at this site, and continued through the spring of 1978. Although coal mining and power generation occur at Colstrip, the effects of mining on water quality have not been detected in creeks having headwaters in the mine area. Influxes of arsenic, mercury, and polynuclear aromatic compounds occurring during snowmelt periods have been linked to scavenging of those contaminants from the plume of the power plant. Snow cover tends to accumulate plume constituents, therby semi-isolating them from the soil and terrestrial biota so that both are denied the extent of contaminant accumulation operative during warmer months. Soluble contaminants accumulating throughout the watershed may consequently be delivered to the stream via the surface runoff associated with snowmelt. Influxes of contaminants delivered intermittently to surface streams via this general route are likely to accumulate in sediments due to normal sedimentation processes and the generally alkaline characteristics of streams in this region which will enhance precipitation of heavy metals. Examination of the Rosebud Creek water quality data for the period of this study indicates that the average concentrations of constituents are at levels considered safe for maintenance of aquatic life. (Moore-SRC)
W81-01489

COMMENT ON 'A NEW COLLOCATION METHOD FOR THE SOLUTION OF THE CONVECTION-DOMINATED TRANSPORT EQUATION' BY GEORGE E. PINDER AND ALLEN SHAPIRO,
Geological Survey, NSTL Station, MS. Water Resources Div.
H. E. Jobson.
Water Resources Research, Vol 16, No 6, p 1135-1136, December, 1980. 3 Fig, 2 Ref.

Descriptors: *Lagrange equation, *Eulerian equation, Dispersion, Equations, *Diffusion, Convection, Mixing, *Transport equation.

The author presents calculations supporting his opinion that the Lagrangian reference frame is superior to the Eulerian for obtaining numerical solutions to the 1-dimensional transport equation.

He claims that the Lagrangian solution is easy to understand, cheap to execute on a computer (1.28 seconds maximum time), stable, and offers a framework from which meaningful information about rate coefficients for transport of nonconservative substances can be estimated. (Cassar-FRC)
W81-01514

PICLORAM IN WATER AND SOIL FROM A SEMIARID PINYON-JUNIPER WATERSHED,
Science and Education Administration, Tucson, AZ.
For primary bibliographic entry see Field 5A.
W81-01521

A WATERSHED STUDY OF GLYPHOSATE TRANSPORT IN RUNOFF,
Science and Education Administration, Coshocton, OH. North Appalachian Experimental Watershed.
W. M. Edwards, G. B. Triplett, Jr., and R. M. Kramer.
Journal of Environmental Quality, Vol 9, No 4, p 661-665, October/December, 1980. 5 Tab, 18 Ref.

Descriptors: *Runoff, *Agricultural runoff, *Herbicides, Rainfall-runoff relationships, Storm runoff, Surface runoff, Erosion, Water pollution control, Watersheds, On-site studies, *Path of pollutants.

The persistence of glyphosate in the soil and its presence in runoff water from field-sized watersheds where it had been used as an herbicide in the production of no-tillage corn and in the establishment of fescue pastures without tillage were evaluated. Each significant runoff event during the growing season was sampled. During the three year study the greatest transport of glyphosate in runoff from any watershed was 165 g/ha, or 1.85% of the amount applied. Most of that loss resulted from a single storm occurring 1 day after an abnormally high glyphosate treatment of 8.96 kg/ha had been applied. At all other sample testing times, the runoff was less than 1% of the glyphosate applied. Both the application rate and the time interval between application and cause for runoff influenced the amount of glyphosate in the runoff. Runoff occurring as a result of a long duration, low intensity storm taking place when the ground was already wet had a lower glyphosate concentration than would be otherwise expected. It was concluded that runoff from fields treated with Roundup herbicide (active ingredient, glyphosate) at recommended concentrations would not constitute an environmental hazard. (Baker-FRC)
W81-01522

THE EFFECT OF A MARSH ON RUNOFF: I. A WATER-BUDGET MODEL,
Oak Ridge National Lab., TN.
D. D. Huff, and H. L. Young.
Journal of Environmental Quality, Vol 9, No 4, p 633-640, October-December, 1980. 5 Fig, 4 Tab, 9 Ref.

Descriptors: *Nutrients, Evaporation, Transpiration, Phosphorus, *Hydrologic budget, Transport, *Model studies, Marsh management, *Marshes, Hydrologic data, Groundwater, Surface water, *Path of pollutants.

Field and simulation studies developed to investigate the transport of nutrients in surface and subsurface water flows across a marsh are discussed. Wingra marsh, which is adjacent to Lake Wingra in Madison, Wisconsin, was used for the studies. Monthly totals of evaporation-transpiration, surface runoff, and subsurface drainage were calculated from April 1970 through August 1976. Urban storm runoff accounts for about 90% of the water in the marsh, while 8% comes from precipitation and 2% from deep ground-water inflow. Surface outflow accounts for 85% of the water that leaves the marsh, while evaporation/transpiration accounts for 7% and shallow ground-water discharge for 8%. The water-budget model developed is able to reproduce water-table fluctuations and estimate the correct level within 10 cm during most of the time. In 1970 the model simulations were begun, and a comparison is offered which indicates that the accuracy of the method is adequate for estimating phosphorus inputs to the lake. (Baker-FRC)
W81-01524

THE OXIDATION OF ARSENITE BY AQUATIC SEDIMENTS,
Saskatchewan Univ., Saskatoon. Dept. of Soil Science.
D. W. Oscarson, P. M. Huang, and W. K. Liaw.
Journal of Environmental Quality, Vol 9, No 4, p 700-703, October/December, 1980. 1 Fig, 3 Tab, 33 Ref.

Descriptors: *Chemical reactions, *Sediments, *Arsenic compounds, Agricultural chemicals, Oxidation, Water quality, Sedimentation, Arsenicals, Pesticides, Lake sediments.

The role of freshwater sediments in the oxidation of As(III) to As(V) was studied. Sediments were taken from five lakes, Buffalo Pound, Pasqua, Echo, Mission, and Katepwa, in Saskatchewan, Canada. These lakes drain a large area of the agricultural land in southern Saskatchewan. Composite samples were used for all experiments. The concentration of As(III) and the ratio of As(III) to As(III) + As(V) in solution indicates that all five lake sediments oxidize As(III) within 48 hr. In the absence of sediment, oxidation of As(III) is not detectable within 72 hr. Sorption of As occurred simultaneously with the oxidation of As(III) to As(V). Over 90% of added As was sorbed by sediments within 72 hr, except in the Buffalo Pound sediment. Flushing of nitrogen or air through the sediment suspensions did not influence the oxidation of As(III). Neither was the oxidation influenced by HgCl2. The oxidation is an abiotic process, with microorganisms occupying only a minor role. (Baker-FRC)
W81-01525

MAXIMUM PESTICIDE CONCENTRATIONS IN AGRICULTURAL RUNOFF: A SEMIEMPIRICAL PREDICTION FORMULA,
Southern Weed Science Lab., Stoneville, MS.
R. D. Wauchope, and R. A. Leonard.
Journal of Environmental Quality, Vol 9, No 4, p 665-672, October/December, 1980. 4 Fig, 2 Tab, 36 Ref.

Descriptors: *Model studies, *Agricultural runoff, *Pesticides, Herbicides, Runoff, Agricultural chemicals, Water quality control, Rainfall-runoff relationships.

A simple semiempirical model is described that predicts single event, edge-of-field bulk runoff concentrations of pesticides in terms of factors such as the physical-chemical properties of the compound, the location of the spray deposit after application, the amount of chemical applied on an area basis, and the dissipation and degradation of spray deposits before runoff occurs. The formula which was constructed is based on data culled from the literature concerning concentrations of pesticides observed in runoff waters. While the formula is crude, it should be useful to water quality planners in their attempts to predict worst-case pesticide inputs from agricultural sources. (Baker-FRC)
W81-01526

SEWAGE FARMING IN IRAQ: A POTENTIAL HAZARD FOR POLLUTION,
Environmental Pollution Research Center, Baghdad (Iraq).
For primary bibliographic entry see Field 3C.
W81-01528

EFFECT OF SEWAGE EFFLUENT ON MICROBIAL ACTIVITIES AND COLIFORM POPULATIONS OF PAHOKEE MUCK,
Florida Univ., Belle Glade.
R. L. Tate, III, and R. E. Terry.
Journal of Environmental Quality, Vol 9, No 4, p 673-677, October/December, 1980. 2 Fig, 4 Tab, 19 Ref.

Descriptors: *Sewage effluent, *Organic matter, Muck soils, Microbial degradation, Coliforms, Sewage treatment, *Sewage disposal, Land subsidence, Soil disposal fields.

The effect of sewage effluent was measured on microbial activity in Pahokee muck. Test plots were amended at weekly intervals with sewage effluent at a rate of 5 cm/wk. In general, the indigenous microbial activity of the effluent-amended soil was greater than that of the soil which was water-amended or untreated. An increase in indigenous activity occurred with the addition of the sewage effluent to the soil, and then declined steadily throughout the week between sewage additions. The increase in activity immediately after amendment reflected the biochemical oxygen demand of the effluent. Anaerobic bacterial populations did not differ significantly between the sewage-effluent or water-amended samples or unamended soil plots. However, significant variations were noted for various sample dates, most likely resulting from soil moisture changes. The augmented dehydrogenase activities and generally elevated carbon metabolic rates in amended soils indicate that microbial activity in the muck was stimulated. Coliform bacteria passed through the soil profile, but the increased moisture, not the nutrients, of the sewage effluent stimulated the oxidation of soil organic matter, thereby stimulating soil subsidence. Therefore a sewage disposal plan involving cultivated organic soils must be viewed as a threat to the longevity of the soils. (Baker-FRC)
W81-01529

EXTRACTION, SPECIATION, AND ANALYSIS OF ARSENIC AND ARSENICAL HERBICIDES IN RUNOFF: EVALUATION OF SIMPLE METHODS AT THE PPB LEVEL,
Southern Weed Science Lab., Stoneville, MS. Chemistry Dept.
R. D. Wauchope, and M. Yamamoto.
Journal of Environmental Quality, Vol 9, No 4, p 597-601, October/December, 1980. 3 Fig, 2 Tab, 12 Ref.

Descriptors: *Herbicides, *Arsenic, Arsenicals, Arsenic compounds, *Pollutant identification, Gas chromatography, Analytical techniques, Water analysis, Runoff, Path of pollutants.

One of the simplest available techniques of speciation and analysis, column chromatography, was applied to the study of arsenic in runoff mixtures of water and sediment. The method involved the following steps: collection of natural runoff samples, spiking of samples with inorganic arsenic (as arsenate) and DSMA at levels similar to those found in cotton-field runoff, separation of water and sediment, extraction and speciation of added and natural arsenic in sediment and water, and quantification of arsenic in the fractions. The separated arsenic species were quantitated at the ppb level by a flameless atomic absorption technique. The arsenate ion is present in the soils as a natural component. Methanearsonate ions are present in the soil due to the use of sodium (MSMA) and disodium (DSMA) salt forms as herbicides. By this method, recoveries ranged from 80-100%, with the relative precision between samples being 10% for concentrations of arsenic between 10 and 200 ppb. It appeared that the arsenate was much more strongly adsorbed by sediments than was methanearsonate. This technique should be useful in determining whether there are significant species changes when arsenate or methanearsonate enter surface impoundments and in studying sediment-water partitioning of the species. (Baker-FRC)
W81-01530

CONTROLLING THE RATE OF ACID LOSS FROM STRIP MINE SPOIL,
Science and Education Administration, University Park., PA. Northeast Watershed Research Center.
H. B. Pionke, A. S. Rogowski, and R. J. de Angelis.
Journal of Environmental Quality, Vol 9, No 4, p 694-699, October/December, 1980. 4 Fig, 2 Tab, 16 Ref.

Descriptors: *Acid streams, *Mine wastes, *Pyrite, Groundwater movement, Mine drainage, Soil

water movement, Acidic water, Water pollution sources, Leaching.

The worsening of groundwater quality especially due to acid products contamination from strip mine spoil is discussed. The experimental design consisted of incubating drained, wetted strip mine spoil in an air or nitrogen atmosphere for various periods of time. When incubation was terminated, the spoil was quickly leached and the leachate was chemically analyzed. The soil material that was used contained substantial concentrations of pyrite (3.8%) and acid products (3.1%). Initial acid losses to groundwater were large if materials were placed deeply, especially when the materials were submerged or frequent flushing occurred. As leaching progressed, diffusion became potentially the limiting factor. Pyrite oxidation in the spoil particle was primarily controlled by either the pyrite oxidation rate or the oxygen diffusion rate. Where oxygen is present in excess and the particle remains water saturated, the initial and subsequent rates of acid production from pyrite will be controlled by the pyrite oxidation rate. When the spoil is deeply submerged, oxygen diffusion is likely to be the limiting factor. The basic particle size is important in controlling rates of salt and acid losses to groundwaters in cases where diffusion is limiting, as this reduces the acid-contributing volumes relative to the total spoil mass. (Baker-FRC)
W81-01531

SOIL POTENTIAL RATINGS FOR SEPTIC TANK ABSORPTION FIELDS IN LEON COUNTY, FLORIDA,
Soil Conservation Service, Lanham, MD.
R. L. Guthrie, and G. J. Latshaw.
Journal of Soil and Water Conservation, Vol 35, No 6, p 278-280, November/December, 1980. 4 Tab, 2 Ref.

Descriptors: *Septic tanks, *Sewage disposal, *Soil disposal fields, Absorption fields, Soil potential index, Land use, Leon County, Florida, Domestic wastes, Percolation, Soil types, Soil properties, Waste disposal, Costs, Estimated costs.

Soil potential ratings were tested in Leon County, Florida, septic tank absorption fields according to the formula, SPI = P - (CM + CL) where SPI = soil potential index, P is index of performance of yield, CM is the index of cost of corrective measures, and CL is the index of costs resulting from continuing limitations. Soil scientists, sanitarians, and contractors worked on different aspects of the soil potential index components in order to calculate reliable figures. A table lists 47 local soils and their SPI. Although all ratings apply only to the local area, this pilot study provides several advantages. Residents have available better information on corrective measures, local regulations, uniformity of procedure, and costs involved. (Cassar-FRC)
W81-01537

BIOLOGICALLY MEDIATED CORROSION AND ITS EFFECTS ON WATER QUALITY IN DISTRIBUTION SYSTEMS,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
S. H. Lee, J. T. O'Connor, and S. K. Banerji.
Journal of the American Water Works Association, Vol 72, No 11, Part 1, p 636-645, November, 1980. 11 Fig, 2 Tab, 42 Ref.

Descriptors: *Corrosion, *Microorganisms, *Pipes, Iron, Distribution systems, Water quality, Metals, Bacteria, Water pollution sources, Tubercles.

The corrosion process in pipes was studied in a four-loop pipe system: two polyvinyl chloride pipes with provisions to insert iron test specimens and two steel pipes. Tap water was circulated throughout the system. Within two days 86% of the dissolved oxygen concentration had been depleted in the steel pipe system, 20% in the PVC pipe. Alkalinity and total hardness, which decreased initially in both systems, continued to decrease in the steel pipes. Sulfate ion, pH, ammonium ion, phosphate, and total organic carbon concentrations changed little or were detected in small amounts. Bacteria identified in all systems were iron-precipitating, sulfate-reducing, denitrifying, and stalk-producing organisms. Corrosion rate was highest initially, decreasing to a steady rate. Examination of corroded material showed the presence of the same bacteria seen in the water. Batch corrosion studies were performed using microorganisms isolated from the water. These grew better as a mixed population than as isolated strains. Since weight loss of test specimens was not appreciable, it is believed that microbes promote a localized corrosion of iron through tubercle formation. (Cassar-FRC)
W81-01544

THE OCCURRENCE OF MICROORGANISMS IN WATER MAIN ENCRUSTATIONS,
Environmental Protection Agency, Dallas, TX. Air and Hazardous Materials Div.
M. J. Allen, R. H. Taylor, and E. E. Geldreich.
Journal of the American Water Works Association, Vol 72, No 11, Part 1, p 614-625, November, 1980. 26 Fig, 1 Tab, 13 Ref.

Descriptors: *Microorganisms, *Distribution systems, *Pipes, Corrosion control, Water distribution(Applied), Bacteria, Tubercles, Water pollution sources.

Microorganisms from encrustations or tubercles inside distribution systems were examined by scanning electron microscope. Samples from several locations throughout the U.S. possessed some common characteristics. A multitude of crystal arrays were found beneath a hard, porous surface. Microorganisms were seen at or near the surface of the tubercles, where nutrients and oxygen are continually present. Diatoms and algae were present in pipes from areas which do not use filtration for treatment of surface waters. Actinomycete bacteria were identified in several specimens. By sequential magnification of a porous specimen, organisms were found growing beneath the surface veneer. The presence of these microorganims in the distribution systems does not reflect inadequate treatment, but rather the adaptability of the microbes to their environment. The populations may be decreased by reducing the nutrient and particulate levels and by improving corrosion control. In severe cases, reconditioning or replacing old water mains and eliminating dead ends may be effective. (Cassar-FRC)
W81-01545

BACTERIAL, CHEMICAL, AND MINERALOGICAL CHARACTERISTICS OF TUBERCLES IN DISTRIBUTION PIPELINES,
Ohio State Univ., Columbus. Dept. of Microbiology.
O. H. Tuovinen, K. S. Button, A. Vuorinen, L. Carlson, and D. M. Mair.
Journal of the American Water Works Association, Vol, 72, No 11, Part 1, p 626-635, November, 1980. 5 Fig, 13 Tab, 35 Ref.

Descriptors: *Microorganisms, *Distribution systems, *Pipes, Corrosion control, Iron oxide, Metals, Bacteria, Pollutants, *Columbus(Ohio), Tubercles, Water pollution sources.

Tubercle deposits collected from pipelines in the Columbus, Ohio, water system were examined to characterize bacteria, chemical composition, and minerals present. The complex environment favors a variety of biological and chemical interactions. Many types of bacteria were present: sulfate reducers, nitrate oxidizers, ammonia oxidizers, sulfur oxidizers, and unidentified aerobic heterotrophic bacteria. Filamentous organisms, coliforms and iron oxidizers were not detected. Iron oxide was the major constituent of tubercles, with Ca, Mg, Al, and Mn present at high levels. All samples contained humic material of varying degrees of polymerization, mostly on the surface of the tubercle or in pits on the pipe surface. Corrosion studies showed that pitting, not uniform corrosion, was the predominant form. Tubercles generally had hard crusty exteriors, where chloride and sulfur had a tendency to accumulate, and fluid-like interiors which dried to a powder. The dissolved organic material and bacteria are believed to catalyze iron corrosion. Deteriorating iron pipes can cause release of pathogenic and toxic materials, taste and color problems, increased treatment demands, and loss of hydraulic capacity. (Cassar-FRC)
W81-01546

A MODEL OF THE MEAN FIELD DISTRIBUTION OF A DISSOLVED SUBSTANCE WITHIN THE RIVERINE LAYER OF A FJORD LAKE,
National Water Research Inst., Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W81-01554

TOWARDS A NITRATE BALANCE FOR ENGLAND AND WALES,
Department of the Environment, Reading (England). Water Data Unit.
T. J. Marsh.
Water Services, Vol 84, No 1016, p 601-606, October, 1980. 6 Fig, 2 Tab, 44 Ref.

Descriptors: *Nitrates, *Fertilizers, *Agricultural runoff, Water pollution sources, *England, *Wales, Nitrogen compounds, Rivers, Water quality, Nitrogen fixation, Path of pollutants, Runoff, Sewage effluents, Waste dilution.

Nitrate levels in lowland rivers in England and Wales are expected to exceed 11.3 mg nitrogen per liter by the mid-1980's. Although sewage effluent and biological fixation contribute some nitrate to the total, agricultural runoff from fertilized lands is the major factor. Since it is unlikely that fertilizer use will decline in the future, it is vital for water suppliers to monitor raw water supplies so that appropriate treatment may be instituted. Results from nitrate sampling at 245 river water monitoring stations show that since 1955 nitrate-nitrogen levels have increased by 44 to 488%. Estimated total nitrate load reaching the tidal limits is 275,000 tons, with 150,000 tons produced by human wastes and 125,000 tons from land runoff. (Cassar-FRC)
W81-01561

A MODEL FOR LAND USE AND WATER QUALITY,
Washington Univ., Seattle. Graduate School of Public Affairs.
For primary bibliographic entry see Field 6A.
W81-01571

DON'T UNDERESTIMATE URBAN RUNOFF PROBLEMS,
Municipal Environmental Research Lab., Cincinnati, OH.
R. Field, and R. Turkeltaub.
Water and Wastes Engineering, Vol 17, No 10, p 48-52, October, 1980. 6 Fig, 3 Tab, 8 Ref.

Descriptors: *Urban runoff, *Storm runoff, *Combined sewers, *Water pollution sources, Organic matter, Dissolved oxygen, Coliforms, Chemicals, Toxicity, Projects, Combined sewer overflow.

While the major emphasis in water pollution control has been on secondary treatment plants, urban stormwater and combined sewer overflow play significant roles in water problems. Only within the past 20 years has it been recognized that runoff contains pollutants picked up from littered streets, dusty roofs, traffic byproducts, hazardous spills, and chemicals used as fertilizers or to control ice. The average BOD of domestic and storm sewer overflow is about one half that of raw sewage, but storm runoff and overflows of great magnitude have a shock loading effect. Forty to 80% of the total organic load entering receiving waters can be caused by runoff. Studies are cited which link dissolved oxygen depletion with urban runoff and excessive fecal coliforms with combined sewer overflow. Toxicity problems can be long-term effect or a short-term emergency; one four-hour storm caused 24,000 gal of oil and grease to bypass New York City's Newtown Creek treatment plant. EPA's Storm and Combined Sewer Research, Development, and Demonstration Program is described. This has as its ultimate goal the control of runoff and combined sewer overflows. (Small-FRC)

W81-01575

HEAVY MINERAL DISTRIBUTION IN BOTTOM SEDIMENTS OF THE BRISTOL CHANNEL, U.K.,
University Coll. of Swansea (Wales). Dept. of Oceanography.
J. V. Barrie.
Estuarine and Coastal Marine Science, Vol 11, No 4, p 369-381, October, 1980.

Descriptors: *Sediments, *Heavy metals, *Channels, Hydraulics, Geologic history, Mineralogy, Bristol channel(UK), United Kingdom, *Bottom sediments.

The influence of channel hydraulics on the light and heavy mineralogy of bottom sediments of the Bristol Channel (United Kingdom) was investigated. Mineral analyses were made of movable noncohesive upper layer benthic sediment. A gradational lateral change in mineralogy was found along the longitudinal axis of the channel, closely following the bathymetric isobaths. The change in mineral composition is coupled with increasing hydraulic inequivalence towards the shallow foreshore zone. Hydraulic equivalence/inequivalence results in selective concentration or dilution of certain minerals. Deviations from standard hydraulic equivalence are indications of distance from source and especially of hydraulic and boundary roughness conditions. Thus, the Holocene transgression within the Bristol channel and the modern hydrodynamic scheme result in the observed heavy mineral distribution. (Small-FRC)
W81-01582

PHOSPHORUS IN SUSPENDED SEDIMENTS OF THE AMAZON RIVER,
Woods Hole Oceanographic Institution, MA.
E. M. Chase, and F. L. Sayles.
Estuarine and Coastal Marine Science, Vol 11, No 4, p 383-391, October, 1980. 1 Fig, 2 Tab, 26 Ref.

Descriptors: *Phosphorus, *Sediments, *Rivers, Estuaries, Soil chemistry, *Suspended sediments, Water chemistry, Algae, Particle size, Mineralogy, Amazon River.

The input of riverborne phosphorus in various particulate forms to the phosphorus budget of the Amazon estuary is evaluated. Samples of Amazon suspended sediments were collected upstream from any tidal influence and analyzed for phosphorus content. Sea water, nitrilotriacetic acid (NTA), K2S2O8, and Na2CO3 fusion extrations were used to determine total flux of phosphorus. Substantial quantities of phosphorus were released from naturally suspended sediments when the sediments were kept in sea water or NTA. Potential availability of phosphorus to algae was estimated at 137 microgram per liter of river water using studies which correlated utilization of sediment phosphorus with freshwater phytoplankton counts. Flux calculations indicate that available particulate phosphorus may be as much as 15 fold greater than dissolved PO4-P (soluble reactive phosphate) during the Amazon rainy season. Dissolved phosphorus would be important only during the dry season. (Small-FRC)
W81-01583

CONCENTRATION AND MICROBIOLOGICAL UTILIZATION OF SMALL ORGANIC MOLECULES IN THE SCHELDT ESTUARY, THE BELGIAN COASTAL ZONE OF THE NORTH SEA AND THE ENGLISH CHANNEL,
Brussels Univ. (Belgium). Lab. of Oceanography.
G. Billen, C. Joiris, J. Wijnant, and G. Gillain.
Estuarine and Coastal Marine Science, Vol 11, No 3, p 279-294, September, 1980. 5 Fig, 4 Tab, 44 Ref.

Descriptors: *Mathematical models, *Microorganisms, *Organic matter, Bacteria, *Estuaries, Oceans, Amino acids, Scheldt estuary, North sea, English Channel.

Concentrations and utilization rates of alanine, aspartate, lysine, glucose, and glycollic, acetic and lactic acids were determined over a seasonal cycle of the water column at three sites: Scheldt estuary, coastal North Sea, and the English Channel. No correlation was observed between the trends of geographical variation of concentration of substrates on one hand, and of utilization rates on the other. Substrate concentrations were not very different at the three sites, while utilization rates differed greatly, with estuarine being the highest, coastal the next highest, and open sea the lowest. A simple model is presented to explain these results. The steady state concentration of a particular substrate is independent of its rate of production and consumption and depends only on physiological characteristics of the bacteria. Using data available in the literature on physiological parameters of marine bacteria, the model accounts for at least the order of magnitude of substrate concentrations observed, and the absence of important seasonal variations. (Small-FRC)
W81-01588

CONTRIBUTION TO THE STUDY ON BOTTOM SEDIMENT IN LAKE BALATON. I. DETERMINATION OF PHOSPHORUS MINERALS IN THE SEDIMENT,
Research Inst. for Water Resources Development, Budapest (Hungary). Inst. for Water Quality Control.
For primary bibliographic entry see Field 2J.
W81-01590

THE DISTRIBUTION OF PELAGIC TARS AND PLASTICS IN THE SOUTH ATLANTIC BIGHT,
South Carolina Wildlife and Marine Resources Dept., Charleston.
R. F. Van Dolah, V. G. Burrell, Jr., and S. B. West.
Marine Pollution Bulletin, Vol 11, No 12, p 352-356, December, 1980. 2 Fig, 2 Tab, 18 Ref.

Descriptors: *Plastics, *Tars, *Oil pollution, Atlantic Ocean, Water pollution sources, Polystyrene beads, Oil wastes, Southeast U.S., Currents(Water), Gulf Stream, Transportation, Ships, Coasts, South Atlantic Bight.

Samples of pelagic tars and plastics were collected by neuston net during six cruises of the R/V Dolphin during 1973-1975 along the Atlantic Coast between 26 and 34 degrees north latitude (Cape Fear, NC. to Cape Canaveral, FL.). Tars were widely distributed throughout the South Atlantic Bight. However, more offshore samples (water depth 200 feet or greater) contained tar, 38.7 to 100%, as compared with near shore samples (water depth less than 200 feet), 26.7 to 72.3%. Tar was detected in a greater percentage of offshore samples during spring than at other times of the year, showing the effect of seasonal currents. Plastic beads, whose distributional patterns were similar to those of tar, were detected in 14.6 to 34.2% of the samples. These results agree with previous work, except that plastic beads were found further south than in the past studies. The authors conclude that the higher incidence of tar and plastic in offshore waters combined with lack of increased concentration of these pollutants near South Atlantic industrial areas indicates that the primary source of contamination is from other areas through entrainment by currents and shipping traffic. (Cassar-FRC)
W81-01602

HYDROCARBONS IN VICTORIAN COASTAL WATERS,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
K. A. Burns, and J. L. Smith.
Australian Journal of Marine and Freshwater Research, Vol 31, No 2, p 251-256, April, 1980. 1 Fig, 1 Tab, 13 Ref.

Descriptors: *Sea water, *Oil pollution, *Organic compounds, Analytical techniques, Municipal wastes, Industrial wastes, Mussels, Sediments, Oil spills, Coasts.

Sea water was analyzed for suspended and dissolved hydrocarbons to study the distribution of petroleum in Victorian coastal waters from chronic sources of oil pollution. A resin adsorption apparatus consisting of a glass fiber prefilter and a stainless column packed with Amberlite AXD-2 and teflon particles was used. Three areas of Victorian coastal waters were selected because of their importance in water quality management. Gas chromatographic and fluorescence patterns were used to distinguish between petroleum hydrocarbons and recent biogenic hydrocarbons. Levels of nonvolatile hydrocarbons in sea water ranged from less than 0.1 microgram/liter (the detection limit) to over 22 microgram/liter near shore-based inputs such as oil refinery effluents. Port Phillip Bay was exposed to higher oil loads than Western Port. Oil refinery effluent was the major input, but there were also various municipal and industrial effluents. Analyses of mussels and sediments confirmed the oil pollution problem in Port Phillip Bay area. Most Western Port areas were free of the effects of oil pollution, although there were intermittent fuel oil spills near wharves. (Small-FRC)
W81-01608

VERTICAL DISTRIBUTION OF METALS IN A SEDIMENT CORE OF A SUBALPINE LAKE INDICATING STAGES IN THE DEVELOPMENT OF CIVILIZATION. (VERTIKALE VERTEILUNG VON METALLEN IM SEDIMENT EINES ALPENVORLANDSEES ALS ZIVILISATIONSINDIKATOREN),
Munich Univ. (Germany, F.R.). Geographisches Inst.
G. Michler, K. Simon, F. Wilhelm, and C. Steinberg.
Archiv fur Hydrobiologie, Vol 88, No 1, p 24-44, February, 1980. 8 Fig, 2 Tab, 32 Ref. (English summary).

Descriptors: *Lake sediments, *Water pollution, Municipal wastes, Cores, Sampling, Metals, Varves, Water pollution, Runoff, Salts, Agricultural runoff, Lakes, Fertilizers, Coal mine wastes, *Bottom sediments, Age, Geologic history, *Bavaria.

A 382 cm sediment core taken from a subalpine lake in Upper Bavaria was examined for pigment content, loss on ignition and metal content (Na, K, Mg, Ca, Fe, Mn, Ni, Pb, Cd, Zn, Cu, and Cr). Loss on ignition and examination of varves showed a nearly constant rate of sedimentation over the past 1500 years, with an average yearly rate of 2.3-2.5 mm. Increased rates of sedimentation were found in the upper layers due to the development of eutrophic conditions in the lake. Anthropogenic influences were noted in the pattern of metal distributions. The increased Na and Cu levels at a depth of 170-180 cm were associated with deforestation during the 13th century, while increases in Mg reflected deforesting in the 14th century. Steady increases in Zn and Cd above 55 cm were connected with coal mining activities in nearby cities. The industrial expansion of the 20th century was observed in increased levels of Cr, Zn, Cd, and Pb, with accompanying greater motor traffic and municipal sewage pollution. High levels of Na and K in the uppermost layers were attributed to highway salting and the use of artificial fertilizers. (Geiger-FRC)
W81-01610

AN EVALUATION OF DIFFERENTIAL PULSE ANODIC STRIPPING VOLTAMMETRY AT A ROTATING GLASSY CARBON ELECTRODE FOR THE DETERMINATION OF CADMIUM, COPPER, LEAD AND ZINC IN ANTARCTIC SNOW SAMPLES,
British Antarctic Survey, London (England).
For primary bibliographic entry see Field 5A.
W81-01612

CHEMICAL SPECIATION OF MERCURY IN NATURAL WATERS,
National Water Research Inst., Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W81-01614

THE EFFECT OF EMERSION ON CADMIUM ACCUMULATION BY MYTILUS EDULIS,
Victoria Ministry for Conservation, Queenscliff (Australia). Marine Science Labs.
For primary bibliographic entry see Field 5C.
W81-01648

POLYCHLORINATED BIPHENYLS IN THE BRISBANE RIVER ESTUARY, AUSTRALIA,
Griffith Univ., Nathan (Australia). School of Australian Environmental Studies.
G. R. Shaw, and D. W. Connell.
Marine Pollution Bulletin, Vol 11, No 12, p 356-358, December, 1980. 1 Tab, 12 Ref.

Descriptors: *Estuaries, *Water pollution sources, *Polychlorinated biphenyls, Aquatic animals, Food chains, Water birds, Food webs, Birds, Fish, Mollusks, Crabs, Arochlors, Sediments, Organic chemicals, Industrial wastes, Chemical wastes, Brisbane River(Australia), *Australia.

Concentrations of polchlorinated biphenyls (PCB) in water, sediments, fish, molluscs, polychaetes, and birds from the Brisbane River estuary were determined. Levels in samples from this industrial area of 900,000 population were similar to those in comparable urban locations. A table lists the species, sample type (for example, whole organism, lipid basis, etc.), and range of concentrations for Aroclor 1254 and 1260. In fish, the PCB concentration was higher in the gills than in muscle, on a lipid content basis. The chromatogram pattern implied that PCB's enter through the gill. Biomagnification of PCB in the food chain did not correlate with trophic class. The sea mullet, which has a low trophic class, showed high concentrations (maximum 2.9 mg per kg). However, the pelican, high on the food chain, exhibited the highest concentration (up to 15.7 mg per kg in muscle). (Cassar-FRC)
W81-01650

5C. Effects Of Pollution

INVESTIGATIONS OF WALKER LAKE, NEVADA: DYNAMIC ECOLOGICAL RELATIONSHIPS,
Nevada Univ. Systems, Reno. Desert Research Inst.
For primary bibliographic entry see Field 2H.
W81-01426

CORRELATION OF SEASONAL VARIATIONS IN PHOSPHOROUS AND NITROGEN SPECIES IN UPPER BLACK WARRIOR RIVER WITH DUCKWEED,
Alabama Univ., University. School of Mines and Energy Development.
F. C. Gabrielson, Jr., A. M. Malatino, and G. J. Santa Cruz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-160996, Price codes: A05 in paper copy, A01 in microfiche. Manuscript 6-77-01, October, 1980. 78 p, 1 Fig, 42 Tab, 21 Ref, 1 Append. OWRT A-052-ALA(1).

Descriptors: *Aquatic weeds, *Plant growth, *Growth rates, *Nutrient requirements, *Period of growth, Seasonal, Aquatic plants, Aquatic life, Freshwater plants, Aquatic vegetation, Aquatic weed control, Nutrients, Rivers, Essential nutrients, Chemical analysis, Nutrient removal, Water quality, Phosphorus, Nitrogen, Correlation analysis, Alabama, *Duckweed.

Water samples were taken for nitrogen and phosphorus from late 1975 through to the Spring of 1977 from nine stations. The drainage system had supported giant duckweed (Spirodela punctata) blooms. While seasonal separation of the data showed possible differences within an impoundment (Bayview Lake), extreme variations made meaningful conclusions difficult to obtain. Daily discharge from a large number of points may have masked seasonal differences. Extensive plant mats were present at minimal levels of nitrogen and phosphorus. The growth rate appeared to be governed more by climate than by nutrient conditions. Laboratory studies indicated that giant duckweed can grow under a wide range of nutrient conditions, including heavy metal concentrations. Growth rate data demonstrated that, without a continual input of nutrients, maximum growth rates do not typically continue beyond 14-20 days, regardless of the initial single element concentration. However, using a continuous nutrient input, growth would probably be inhibited only by extreme climate conditions. (Zielinski-IPA)
W81-01428

LAKE ERIE NUTRIENT CONTROL: EFFECTIVENESS REGARDING ASSESSMENT IN EASTERN BASIN.
State Univ. of New York Coll. at Buffalo. Great Lakes Lab.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-225097, Price codes: A05 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/3-80-067, July, 1980. 100 p, 26 Fig, 18 Tab, 30 Ref. R802706.

Descriptors: *Lake Erie, *Limnology, *Eutrophication, *Biota, Great Lakes, Water pollution, Invertebrates, Phytoplankton, Zooplankton, Benthos, Oxygen demand, *Nutrients, Aquatic environment, Water temperature, Biomass, Phosphorus, Nitrogen, Mesotrophy, Aquatic populations.

A three year synoptic monitoring program was conducted on 26 stations in the Eastern Basin of Lake Erie from 1973 to 1975. The data generated include major nutrients, temperature structure, and oxygen depletion as well as phytoplankton, zooplankton and benthic macroinvertebrate dynamics. The Eastern Basin surface waters were differentiated into five discrete areas with each water mass characterized by a different physiochemical variable. These areas appeared to be highly influenced by local inputs from specific tributaries and population centers. Anoxic conditions were not observed in the hypolimnetic waters of the Eastern Basin over the study duration and the oxygen demand was calculated to be approximately 0.011 g oxygen/cubic meter/day. The Eastern Basin has remained relatively stable over the past five years with the exception of a decrease in phytoplankton biomass, increase in nitrogen, and a doubling of benthic macroinvertebrates. Several organisms, especially the oligochaetes, associated with more eutrophic values of the Western and Central Basin have become established in large numbers within the Eastern Basin. From a trophic standpoint, the basin can be classified as mesotropic. Reductions in algal growth may be in response to pollution abatement, particularly phosphorus. (Moore-SRC)
W81-01438

EFFECT OF CARBON, AMMONIA NITROGEN AND HYDRAULIC LOADING RATES, RPM, AND EXPOSED SURFACE AREA VARIATIONS ON RBC PERFORMANCE,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W81-01476

MICROFAUNA AND RBC PERFORMANCE: LABORATORY AND FULL SCALE SYSTEMS,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W81-01477

CHEMICAL CONTAMINANTS AND BIOLOGICAL ABNORMALITIES IN CENTRAL AND SOUTHERN PUGET SOUND,
National Marine Fisheries Service, Seattle. Northwest and Alaska Fisheries Service.
D. C. Malins, B. B. McCain, D. W. Brown, A. K. Sparks, and H. O. Hodgins.
NOAA Technical Memoorandum OMPA-2, November, 1980. 311 p, 78 Fig, 38 Tab, 127 Ref, 9 Append.

Descriptors: *Estuarine environment, *Washington, *Water pollution, *Sediments, *Aquatic animals, *Animal pathology, Chlorinated hydrocarbon pesticides, Water pollution effects, Invertebrates, Fish, Arsenic, Lead, Organic compounds, Polychlorinated biphenyls, Metals, Oil pollution, Benthic fauna, Crabs, Shrimp, Clams, Worms, Puget Sound(WA).

Samples of sediments and bottom-dwelling fishes, crabs, shrimps, clams, and worms were collected at quarterly intervals in 1979 from four urban embayments in Puget Sound: Elliott Bay (Seattle), Commencement Bay (Tacoma), Sinclair Inlet (Bremerton), and Budd Inlet (Olympia). Similar sampling was done in two nonurban areas: Case Inlet and Port Madison. Sediment samples were analyzed for petroleum hydrocarbons, polychlorinated biphenyls, chlorinated pesticides and other chlorinated organic compounds, and metals. The community characteristics of the sediment-associated invertebrates and bottom fish were defined; and their tissues were analyzed for the above-mentioned organic compounds and metals. The highest concentrations of the organic compounds and some metals, such as arsenic and lead, in sediments were in samples from the waterways of Commencement Bay; the Duwamish Waterway, Seattle Watefront, and West Point areas of Elliott Bay; and from Point Herron in Sinclair Inlet. Highest concentrations of many of the chlorinated organic compounds, including hexachlorobutadiene, were in sediment samples from Commencement Bay and its adjacent waterways. Tissue samples generally had concentrations of organic contaminants which reflected the chemical composition of sediment in the subarea from which the organisms were obtained. Petroleum hydrocarbons, polychlorinated biphenyls, chlorinated pesticides, hexachlorobenzene, and hexachlorobutadiene were detected in various concentrations in several types of organisms from both urban and nonurban sites. In most cases animals were also examined for grossly visible and microscopic lesions. Several types of liver lesions were found more frequently in fish from sampling areas with the sediments most highly contaminated by toxic chemicals. Abnormalities were also found in shrimp and crab species in the most polluted areas. (Moore-SRC)
W81-01479

EFFECTS OF THERMAL POLLUTION ON PELAGIC LARVAE OF CRUSTACEA,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
A. N. Sastry.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-222037, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/3-80-064, July, 1980. 65 p, 25 Fig, 13 Tab, 68 Ref. R-800981.

Descriptors: *Thermal pollution, *Crustaceans, *Larvae, *Estuarine environment, *Salinity, Invertebrates, Water pollution, Growth stages, Coasts, Physiological ecology, Animal physiology, Environmental effects, Cycles, Animal metabolism, Commercial shellfish, Lobsters, Crabs, Shrimp, Water temperature.

Thermal alterations of the coastal and estuarine environments from conventional and nuclear power plants may have considerable effects on the biotic communities. To develop the capability for assessment of the effects of thermal alterations, there is a need for a comprehensive understanding of the effects of thermal changes on all the life stages of populations within the communities. Larvae of six species were studied: Cancer irroratus, C. borealis and Homarus americanus of coastal waters; and Palaemonetes pugio, Pagurus longicarpus and Rhithropanopeus harrisii, from the estuarine region. Larvae were cultured at various combinations of temperature and salinity, and highest survival rates and limits for complete development determined. Generally, coastal species had a more restrictive temperature range for complete development than estuarine species. Survival was betteer for C. irroratus larvae cultured under certain daily cyclic regimes versus a constant temperature. The larvae of coastal species C. irroratus and H. americanus were metabolically active over a narrower temperature range compared to the primar-

ily estuarine species Palaemonetes pugio. Metabolic - temperature response patterns of the larval stages of each species cultured at daily cyclic temperatures were altered relative to those cultured at comparable constant temperatures. When temperature and low dissolved oxygen stresses were combined, the thermal tolerance limits of C. irroratus larval stages were altered. (Moore-SRC)
W81-01482

CHARACTERISTICS OF BENTHIC ALGAL COMMUNITIES IN THE UPPER GREAT LAKES,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
E. F. Stoermer.
Environmental Protection Agency Report EPA-600/3-80-073, July, 1980. 79 p, 1 Tab, 16 Ref, Append. 803037.

Descriptors: *Great Lakes, *Benthic flora, *Eutrophication, *Aquatic algae, Water pollution, Water quality, Algae, Benthos, Diatoms, Limnology, Oligotrophy, Distribution.

The upper Great Lakes contain a diverse array of benthic algal communities. Diatoms are the dominant taxonomic group present in terms of numbers, and usually in terms of biomass, except in eutrophic areas. Communities in areas receiving minimal direct anthropogenic impact are extremely diverse in terms of both species richness and population evenness. A significant number of populations found in undisturbed habitats in the upper Great Lakes have not been previously reported from North America. Benthic communities in more eutrophic areas are characterized by a greater abundance of eurytopic and widely distributed taxa. Many of these species are familiar elements of the floras of smaller, mesotrophic to eutrophic lakes. The communities of directly impacted areas contain a more limited suite of very tolerant populations, usually occurring in high abundance. Species usually reported from saline inland waters or brackish water are a conspicuous element of the flora in highly disturbed regions. The available evidence indicates that the range of many oligotrophic species which originally occupied the entire upper Great Lakes has been severely restricted. Such populations are apparently adversely affected by very low levels of contamination, which suggests that they may be useful in early detection of adverse trends in the system. The recent introduction of a number of species not characteristic of oligotrophic systems, or indeed even of freshwater lakes, indicates continuing degradation of the upper Great Lakes. (Moore-SRC)
W81-01487

ENVIRONMENTAL EFFECTS OF WESTERN COAL SURFACE MINING, PART VIII-FISH DISTRIBUTION IN TROUT CREEK, COLORADO, 1975-1976,
Colorado Div. of Wildlife, Fort Collins. Fisheries Research Center.
J. P. Goettl, Jr., and J. W. Edde.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-224736, Price codes: A03 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/3-80-070, July, 1980. 36 p, 3 Fig, 7 Tab, 19 Ref. R803950.

Descriptors: *Mine drainage, *Coal mines, *Fish, *Mine water, Water pollution, Colorado, Brook trout, Rainbow trout, Brown trout, Sculpins, Dace, Fish management, Distribution, Toxicity, Fish stocking, *Environmental effects, *Trout Creek(CO).

A study was conducted on Trout Creek in northwestern Colorado during 1975-1976 to assess the effects of drainage from an adjacent surface coal mine on the distribution of fishes in the creek, and to relate their distribution to physical and chemical variables. A second objective was to determine the possible toxicity off surface coal mine drainage water on fish stocked in ponds receiving surface and groundwater run-off from the mine. Results did not indicate any direct effects of mine drainage water on the distribution of fishes in Trout Creek, although possible effects may have been masked by elevation, stream flow, streambed alterations, and agricultural irrigation return flows. Brook trout (Salvelinus fontinalis) was the dominant salmonid species in the upper reaches of the creek; rainbow trout (Salmo gairdneri) and brown trout (S. trutta) were found only in the region of the mine. Mottled sculpin (Cottus bairdi) and speckled dace (Rhinichtys osculus) were the most common fishes found throughout and at all but the uppermost reaches, respectively. Rainbow trout stocked in mine seepage water ponds for a year evidenced high survival rates over an eight-month period during the winter, but fared poorly during the ensuing summer months, this latter most probably because of extremely high water temperatures. There was no apparent evidence of toxicity to the fish from contaminants in the mine pond water. (Author's abstract)
W81-01488

EFFECTS OF WATER QUALITY ON FISH,
Purdue Univ., Lafayette, IN. Dept. of Forestry and Natural Resources.
A. Spacie.
Purdue University Cooperative Extension Service, 208 Planning Notes, prepared by the Indiana Inter-Agency Information and Education Committee on Non-Point Source Pollution, Planning Note No 9, (1980). 4 p, 1 Fig, 1 Tab.

Descriptors: *Water quality, *Fishkill, *Pollutants, Oxygen, Pesticides, Ammonia, Siltation, Water pollution effects, Fish, *Indiana, Federal Water Pollution Control Act.

This is one of a series of fact-sheets being developed concerning the Federal 'Clean Water Act' (Public Law 92-500) and water quality management planning efforts underway in Indiana, as prescribed by Section 208 of the Law. Major emphasis in the fact sheets is on non-point sources of pollution, their effects on water quality, possibilities for control and the implications of various control strategies, the purpose of this series is to provide an 'information base' for meaningful citizen input into the water quality management planning process at the local level. This fact sheet answers such questions as Who's to blame for fish kills. What are the effects of pollutants. What are the major causes of fish kill, and Will water quality management make a difference.
W81-01504

MICRO-ORGANIC COMPOUNDS IN THE WATER ENVIRONMENT AND THEIR IMPACT ON THE QUALITY OF POTABLE WATER SUPPLIES,
Water Research Commission, Pretoria(South Africa).
G. J. Stander.
Water SA, Vol 6, No 1, p 1-14, January, 1980. 6 Fig, 19 Tab, 25 Ref.

Descriptors: *Organic compounds, *Potable water, *Public health, Pollutant identification, Water quality, Odor, Taste, *Water pollution effects, Reviews, Chlorination, Water purification, *Water treatment, Pollutants.

Sources of organics in natural waters are decay of animal and plant life, biological activities, industrial wastes, domestic wastes, and non-point sources such as agricultural chemicals and combustion products. Although up to 360 organic compounds have been identified in drinking water in a number of countries, only about 50 occurred at concentrations above 1 microgram per liter. Since analysis of water for micro-organics is very costly, it is suggested that bioassay screening tests be performed on water supplies most likely to be polluted with organic chemicals. If these tests have positive results, further identification and toxicologic studies should be performed. Chlorination may intensify odor and taste problems by forming undesirable halogenated hydrocarbons. Treatment plants which remove trace organic compounds completely are beyond practical considerations. Therefore, it is better to clean up industrial and sewage effluents before they reach the water purification process. (Cassar-FRC)
W81-01505

CANCER MORTALITY AND PUBLIC DRINKING WATER IN ST. LOUIS CITY AND COUNTY,
Missouri Univ.- Columbia.
For primary bibliographic entry see Field 5F.
W81-01534

ELEVATED LEVELS OF SODIUM IN COMMUNITY DRINKING WATER,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 5F.
W81-01535

NUTRIENT RUN-OFF FROM THE CATCHMENT AREA TO A SMALL LAKE WITH NO EFFLUENT,
Instytut Gleboznawstwa i Chemii Rolnej, Lublin (Poland).
M. Misztal.
Acta Hydrobiologica, Vol 22, No 1, p 55-66, 1980. 3 Fig, 3 Tab, 13 Ref.

Descriptors: *Nutrients, *Agricultural runoff, *Lake sediments, Water chemistry, Watersheds(Basins), *Lakes, Soil chemistry, Phosphorus, Calcium, Sodium, Potassium, Precipitation(Atmospheric), *Poland, Inflow.

The effects of agricultural runoff and woodland runoff on the chemical composition of shallow sediments in Lake Piaseczno (Leczynsko-Wlodawshie Lake District, Poland) were examined. The catchment area is made up of 48 ha of woods, 85 ha of water, and 131 ha of agricultural lands. Soils in the catchment area and lake sediments were sampled and analyzed for chemical content. K(+), Na(+), Ca(++) were determined by the photmetric method, while P was determined with ammonium molybdate, and Mg(++) was determined with titanium yellow. Rainfall during the sampling period (1973-1976) was also measured. Correlation coefficients indicated a close relationship between water soluble forms of potassium salt, manganese, and sodium found in both the soil and the sediments. No correlation was found between their contents of phosphorus compounds. The effects of rainfall were noted. High water levels in the lake tended to counteract penetration of enriched groundwaters into its basin. Drought was not conducive to the accumulation of phosphorus compounds, while during a wet year (1974), water soluble forms of phosphorus increased in the lake. Lake water pH was highest during times of increased rainfall. (Small-FRC)
W81-01553

TOWARDS A NITRATE BALANCE FOR ENGLAND AND WALES,
Department of the Environment, Reading (England). Water Data Unit.
For primary bibliographic entry see Field 5B.
W81-01561

IDENTIFICATION OF A DYNAMIC LAKE MODEL BY THE GROUP METHOD OF DATA HANDLING: AN APPLICATION TO LAKE ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W81-01578

SIMULATION OF SOIL NUTRIENTS LOSSES RESULTING FROM RAINFALL ACIDITY,
Colorado State Univ., Fort Collins.
J. O. Reuss.
Ecological Modelling, Vol 11, No 1, p 15-38, October, 1980.

Descriptors: *Mathematical models, *Acidic water, *Leaching, Soil properties, Precipitation(Atmospheric), Nutrients, *Soil chemistry, Ion exchange, Ions, Chemical reactions, *Acid rain, Adsorption.

A simulation model is described which provides a quantitative system using basic soil chemistry to predict the most likely effect of rainfall acidity on the leaching of cations from noncalcareous soils. The model uses the relationships between lime potential and base saturation (Clark and Hill, 1964, and Turner and Clark, 1964), the equilibrium between CO2 partial pressure and H+ and HCO3- in solution, the apparent solubility product of Al(OH)3, the equilibrium of cations and anions in solution, the Langmuir isotherm description of sulfate adsorption, and mass balance considerations. It predicts the distribution of ions between the solution and sorbed or exchangeable phases. Thus, ionic composition of leachate can be computed. The initial model results indicate that base removal due to rainfall acidity from actual soil systems can be investigated experimentally by increasing the acidity of applied water to levels in excess of that normally found in rain. This shortens the necessary experimental time. (Small-FRC)
W81-01579

CORRELATION BETWEEN UREA AND OTHER CHEMICAL AND BIOLOGICAL PARAMETERS IN WATERS OF LAKE SUWA, JAPAN,
Yamagata Univ. (Japan). Dept. of Chemistry.
Y. Satoh, T. Okino, and K. Aoyama.
Internationale Revue der Gesamten Hydrobiologie, Vol 65, No 3, p 445-454, 1980. 3 Fig, 1 Tab, 29 Ref.

Descriptors: *Ureas, *Eutrophication, *Decomposing organic matter, Nutrients, *Lakes, Nitrogen, Phytoplankton, Photosynthesis, *Japan, Lake Suwa(Japan).

The vertical profiles of chemical and biological treatment parameters, including urea concentration, were measured periodically since 1977 in Lake Suwa, Japan, a typical eutrophic lake. The standing stock of urea in a central water column of the lake showed two major peaks around May 1977 and May 1978, and three minor peaks around early August, late September, and mid-November 1977. These peaks may be due at least in part to urea production by bacterial decomposition of dead phytoplankton. The ratio between standing stock of urea and that of total inorganic nitrogen in the eutrophic zone increased significantly from mid-July to early October in 1977. This ratio was significantly lower the rest of the year; however, the standing stock of urea was relatively high. On the basis of Kendall's rank correlation coefficient, urea has been suggested to act as a nutrient during the process of photosynthesis on 7 days out of 33 observed. Also, the tau coefficients of urea to ammonia, nitrite, total carbonate carbon, gross production, net production, dissolved oxygen, and pH demonstrated a correlation significant enough to support the assumption that urea acted as a nutrient in the course of photosynthesis by phytoplankton. Thus, the vertical distribution of urea may be regulated by the photosynthetic activities of phytoplankton on certain occasions. (Small-FRC)
W81-01592

CHEMICAL AND MINERALOGICAL COMPOSITION OF THE MUD-WATER INTERFACE OF THE LAKE HULEH (ISRAEL) PRESERVE,
Pittsburgh Univ., PA. Dept. of Biological Sciences.
U. M. Cowgill.
Internationale Revue der Gesamten Hydrobiologie, Vol 65, No 3, p 379-409, 1980. 25 Fig, 43 Ref.

Descriptors: *Mud-water interfaces, *Lake sediments, *Chemical reactions, On-site investigations, Sediments, Ponds, Rivers, Sediment transport, Sorption, *Israel, Metals, Elements(Chemical), Mineralogy.

The chemical composition of the mud-water interface of a shallow pond with an inlet and an outlet was determined. Elements found in the mud-water interface of Lake Huleh Preserve (Israel) to a greater extent than in the surface waters were: Na, K, Ca, Ag, Cu, Mg, Sr, Ba, Zn, B, Ga, Se, Y, La, Ce, Si, Ge, Pb, Hf, P, As, Nb, S, Se, Cr, F, Mn, Co, and Ni. Some elements, including Br and Cd, are sorbed and retained by organic matter. Others behave as a sort of colloidal soup; elements (Cs, Be, Hg, Sn, Ti, Zr, Bi, V, Mo, I, and Fe) are sorbed by the scavenger action of ferric hydroxide type complexes. A chemical comparison of the composition of the Jordan River before and after it leaves the preserve gives some indication of the contributions of the river. Elements that showed a positive effect were: Na, Rb, Cu, Mg, Ca, Ba, Zn, Cd, Al, Ga, Y, La, Ce, Si, Ge, Sn, Pb, and others. The drainage of carp ponds into the preserve has a chemical effect on the Jordan River. (Small-FRC)
W81-01595

ACIDIFICATION OF A SMALL WATERSHED IN SOUTHERN NORWAY AND SOME CHARACTERISTICS OF ACIDIC AQUATIC ENVIRONMENTS,
Oslo Univ. (Norway). Zoological Inst.
J. P. Nilssen.
Internationale Revue der Gesamten Hydrobiologie, Vol 65, No 2, p 177-207, 1980. 11 Fig, 6 Tab, 109 Ref.

Descriptors: *Air pollution, *Acidity, *Lakes, Fish, Aquatic life, Small watersheds, Precipitation(Atmospheric), Invertebrates, Plankton, Hydrogen ion concentration, *Norway, *Acid rain.

Freshwater lakes in a region of southern Norway which receives a substantial amount of atmospheric pollutants were studied for acidity and biolgical characteristics. Precipitation in the area has a pH of 4.2-4.5. The acid originates further south in Europe, but prevailing winds bring this pollution to Norway. In some lakes which have lost buffering capacity, spring thaw and autumn rain are accompanied by increases in conductivity and in sulfate deposition, and by a conspicuous drop in pH. Decreasing pH, increasing conductivity, and increasing total hardness have been observed in a river draining the area. Fish, daphnia, and chaoborus have disappeared from the most acidic lakes, and these lakes are characterized by increasing abundance of Juncus bulbosus and macrophytes covered by filamentous algae. Pelagic zooplankton are mainly of the littoral species, and there are no leeches or gastropods. Brown trout is the fish most resistant to acid, while Eurasian perch were absent from most of the acid lakes. Moderately acidic lakes contained abundant food for carnivorous fish. (Small-FRC)
W81-01596

ON THE MECHANISM REDUCING THE PHOSPHATE CONCENTRATION IN THE WATER OF LAKE BALATON,
Research Inst. for Water Resources Development, Budapest (Hungary). Inst. for Water Quality Control.
E. Dobolyi, and S. Herodek.
Internationale Revue der Gesamten Hydrobiologie, Vol 65, No 3, p 339-343, 1980. 3 Fig, 3 Ref.

Descriptors: *Phosphorus compounds, *Nutrient removal, *Organic matter, *Hungary, Eutrophication, Algae, Lake Balaton(Hungary), Phosphates, Water pollution, Lake sediments, Aquatic algae, Plankton, Lakes, Bacteria, Aquatic life.

The main process responsible for phosphate reduction in Lake Balaton, Hungary, was direct uptake by algae. Although this lake's phosphate load grows continually, the dissolved orthophosphate has remained at a low level, 1 to 14 micrograms per liter. When phosphate was added to lake water in situ and in vitro, it was quickly removed. However, addition of sodium hypochlorite to kill algae and bacteria caused the phosphate level to remain constant, showing that biolgical activity was responsible for phosphate removal. When a complexing agent was added to prevent formation of biogenic lime, it did not influence rapid phosphate removal. A photooxidation experiment also showed that phosphate was incorporated into organic particulate matter. (Cassar-FRC)
W81-01597

A LIMNOLOGICAL RECONNAISSANCE OF THE LOUGH ERNE SYSTEM, IRELAND,
Ministry of Agriculture, Antrim (Northern Ireland). Freshwater Biological Investigation Unit.
For primary bibliographic entry see Field 2H.
W81-01598

COMBINED EFFECT OF THE CHLORIDES OF MERCURY AND COPPER IN SEA WATER ON THE EURYHALINE AMPHIPOD GAMMARUS DUEBENI,
Southhampton Univ. (England). Dept. of Oceanography.
S. M. Moulder.
Marine Biology, Vol 59, No 4, p 193-200, 1980. 5 Fig, 2 Tab, 19 Ref.

Descriptors: *Mercury, *Copper, *Amphipoda, *Water pollution effects, Metals, Sea water, Aquatic animals, Crustaceans, Invertebrates, Toxicity, Absorption, Water quality standards, Interactions.

A sublethal level of copper reduced the toxicity of inorganic mercury in Gammarus duebeni, a euryhaline amphipod. The metals, used as chlorides, were tested using 3 independent methods: 96 hours LC50, diuresis, and degree of Hg accumulation. LC50 values were as follows: Cu only, greater than 10,000; Hg only, 122; Hg preceded by pretreatment with a sublethal dose of Cu, 165; Hg plus Cu, 1520. Likewise, Cr51-EDTA clearance tests showed that Cu and Hg together (t1/2 value 81.3 hours) had less influence on diuresis than their additive effects (81.9 and 67.9 hours, respectively). Cu and Hg together produced less Hg accumulation in Gammarus than a program of Cu pretreatment followed by Hg exposure. This was also true in organic-free media. Hg accumulation concentration factors after 25 hours were Hg alone, 340; Hg plus Cu, 62; and Hg with Cu pretreatment, about 50. The possible mechanisms of interaction between Hg and Cu, including binding on SH sites and detoxification, were discussed. (Cassar-FRC)
W81-01599

FISH POPULATION DYNAMICS UNDER NUTRIENT ENRICHMENT - A CASE OF THE EAST SETO INLAND SEA,
Kyoto Univ. (Japan). Dept. of Applied Mathematics and Physics.
S. Ikeda, and T. Yokoi.
Ecological Modelling, Vol 10, No 3/4, p 141-165, August, 1980. 16 Fig, 7 Tab, 11 Ref.

Descriptors: *Mathematical models, Fish, *Predation, Plankton, *Fish populations, Eutrophication, Nutrients, Nitrogen, Phosphorus, Environmental effects, Mortality, *Seto Inland Sea(Japan), Japan.

A theoretical model of fish population dynamics in a primarily nitrogen and phosphorus enriched eutrophic inland sea is presented. A significant increase in pollutants in the sea and the slow exchange rate of sea water between the sea and the ocean have worsened the general condition of the East Seto Inland sea in recent years. The proposed model is based on the prey-predator relationship of the Lotka-Volterra type. The model was validated by checking recent fishery statistics of the area. The three population variables are: plankton, small fish, and large fish. Assessment of the effect of external pollution loading was essential for the identification of fish population dynamics in the sea. The simulation shows that the assumptions on fish mortality and carrying capacity of plankton in the nutrient-enriched sea could partially explain trends in recent fish catches. (Small-FRC)
W81-01603

THE TURNOVER RATE OF DISSOLVED ORGANIC MATERIAL IN WATERS USED BY ANADROMOUS PACIFIC SALMON ON THEIR RETURN TO GREAT CENTRAL LAKE ON VANCOUVER ISLAND, BRITISH COLUMBIA, CANADA,
Tsukuba Univ., Ibaraki (Japan). Inst. of Biological Sciences.
H. Seki, E. A. MacIsaac, and J. G. Stockner.
Archiv fur Hydrobiologie, Vol 88, No 1, p 58-72, February, 1980. 3 Fig, 4 Tab, 26 Ref.

Descriptors: *Oligotrophy, *Fish migration, *Salmon, *Aquatic ecosystems, Nitrogen, Phos-

phorus, Nutrients, *Organic matter, Carbohydrates, *Lakes, Microbial degradation, Fertilizers, Spawning, Sockeye slamon, Phytoplankton, Aquatic productivity, Water quality, Pulp wastes, Surface waters, *Great Central Lake(Canada), Vancouver Island(BC), British Columbia.

When salmon return to freshwaters to spawn, it is theorized that an olfactory imprinting device allows them to locate their parent stream. The turnover rate of dissolved organic materials by microbial activity is considered an important factor in the chemistry of this aquatic spawning system. In the present study, the uptake kinetics of a variety of organic substrates in the surface layer of aquatic systems through which adult salmon pass on their return to Great Central Lake inlet were examined. Particulate organic carbon levels were highest in surface waters of Trevor Channel and central Alberni Inlet. This was attributed in part to the organic matter discharged by the pulp mill at the head of the inlet. The microbial differences of fertilized and unfertilized areas of this Canadian lake were also studied, and the increases in primary production in response to phosphorus and nitrogen additions were investigated. Turnover times were a few weeks at the entrance to Alberni Inlet, a few days in central Alberni Inlet, a few weeks in the Stamp River, a few weeks for amino acids and galactose, and less than several days for organic acids and glucose in Great Central Lake. Fertilized regions produced higher microbial biomass, a concept which is discussed in terms of increased organic excretions from the growth-stress oscillating phytoplankton population. Heterotrophic uptakes and primary production indicate that the Great Central Lake is within the steady-state equilibrium of a temperate oligotrophic lake. (Geiger-FRC)
W81-01607

AMMONIA MINERALIZATION AND CYCLING IN SHAGAWA LAKE, MINNESOTA,
Oklahoma State Univ., Stillwater. School of Biological Sciences.
For primary bibliographic entry see Field 2H.
W81-01609

THE EFFECT OF EMERSION ON CADMIUM ACCUMULATION BY MYTILUS EDULIS,
Victoria Ministry for Conservation, Queenscliff (Australia). Marine Science Labs.
N. Coleman.
Marine Pollution Bulletin, Vol 11, No 12, p 359-362, December, 1980. 2 Tab, 25 Ref.

Descriptors: *Cadmium, *Mussels, *Water pollution effects, Metals, Aquatic animals, Shellfish, Path of pollutants, Victoria(Australia), *Australia, Mytilus edulis, Submergence, Littoral.

Mussels were immersed for 15 days in sea water and in sea water containg 0.35 ppm or 0.035 ppm cadmium either continuously or alternately submerged and drained. Results, expressed in ppm Cd per dry weight, were as follows: sea water drained, 1.13 + or - 0.42; sea water undrained, 1.57 + or - 2.17; 0.035 ppm Cd drained, 24.1 + or - 6.61; 0.035 ppm Cd undrained, 38.96 + or - 27.03; 0.35 ppm Cd drained, 155.5 + or - 55.06; 0.35 ppm Cd undrained, 277.55 + or - 93.28. Lowest Cd concentrations were found in drained mussels in sea water; highest in mussels in undrained water containing 0.35 ppm Cd. Although drained mussels were submerged for only half as long as undrained mussels, they accumulated more than half as much Cd. This may have been the result of increased activity upon reimmersion. After only 15 days, mussels exposed to 0.035 ppm Cd, permissible under current legislation in Victoria, accumulated more than the 2.0 ppm net weight limit specified for human consumption. (Cassar-FRC)
W81-01648

TISSUE DISTRIBUTION OF MERCURY IN NORMAL AND ABNORMAL YOUNG COMMON TERNS,
Rutgers Medical School, Piscataway, NJ. Div. of Occupational and Community Medicine.
M. Gochfeld.
Marine Pollution Bulletin, Vol 11, No 12, p 362-366, December, 1980. 3 Tab, 27 Ref.

Descriptors: *Mercury, *Birds, *Terns, *Water pollution effects, Water pollution sources, Water birds, Liver, Food chains, *Long Island(NY), New York, Path of Pollutants, Pollutant identification.

The large right lobe of the liver was the single tissue which provided the best estimate of mercury levels in other tissues, according to Hg tissue distribution studies done on 16 young Common Terns from colonies on the south shore of Long Island, New York. Whole blood and kidney had mean correlation coefficients of 0.38 and 0.36 respectively, near that of liver, 0.40. Muscle, brain, and feather showed little correlation, 0.18, 0.02, and 0.22. Levels were highest in blood and lowest in brain. Four birds which showed feather loss had about twice the mercury level in all tissues compared to the 12 normal birds. Levels of Hg in chicks 10-30 days old were slightly, but insignificantly, higher than compared with chicks 1-9 days old. (Cassar-FRC)
W81-01649

5D. Waste Treatment Processes

STATE OF WASHINGTON INDUSTRIAL WASTE SURVEY.
URS Co., Seattle, WA.
Report prepared for Washington State Department of Ecology, 1980. 45 p, 3 Fig, 7 Tab, 3 Append, 14 Maps.

Descriptors: *Washington, *Surveys, *Industrial wastes, *Waste water treatment, *Municipal water, Pollutants, Pre-treatment(Water), Cities, Sewage treatment, Chemical analysis, Pollutants, Organic compounds, Toxicity, Waste dilution, Measurement, Pulp and paper industry.

Many communities treat both industrial and residential waste waters at the municipal waste water treatment plant. The EPA-promulgated Pretreatment Regulation governs the control of industrial wastes into Publicly Owned Treatment Works (POTWs). Washington State needed definitive data to determine which POTWs would require local pretreatment programs. An industrial waste survey was conducted of commercial and industrial users that discharge, or potentially discharge, liquid and solid wastes to the sewer systems of 14 municipalities. Twenty-one industrial categories were included, as were businesses discharging excess pollutants. The survey, directed toward 129 species of chemical compounds representing 65 priority pollutant groups, was in two phases: inventory development, and questionnaire review and follow-up. Industries were initially identified by SIC code to determine suitability. Questions were asked to determine type of waste produced, general waste water characteristics of the facility, and the use and disposal of priority pollutants, Statewide, the major priority pollutant compounds identified included the heavy metals, aromatic and chlorinated hydrocarbons, phenolic compounds and cyanide. The major source of priority pollutants appeared to be paper products firms and inorganic chemical manufacturers. Breweries, photofinishers and hospitals may also produce and/or discharge priority pollutants. Each municipal sewer ordinance was evaluated using EPA's Model Ordinance covering industrial waste dischargers; however, none covered all of EPA's provisions. (Atkins-Omniplan)
W81-01434

FINE SOLIDS REMOVAL FOLLOWING COMBINED CHEMICAL-TRICKLING FILTER TREATMENT,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
J. C. Brown.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-140659, Price codes: A03 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/2-80-099, July, 1980. 36 p, 7 Fig, 7 Tab, 1 Ref. 68-03-0225.

Descriptors: *Waste water treatment, *Settling basins, *Filtration, *Suspended solids, Water purification, Chemical precipitation, Sewage treatment, Flocculation, Trickling filters, Treatment, Sludge.

Significant carryover of fine alum floc solids was observed in final effluent during earlier plant-scale studies of alum addition to the final clarifier of a high-rate trickling filter train of a waste water treatment plant. The effectiveness of fine solids settling ponds, and various types of granular media filters for removing residual fine solids from the effluent of a conventional, high-rate, rock media trickling filter plant when alum is applied ahead of secondary clarification is evaluated. Two pilot settling ponds, one covered and one open, were operated at detention times ranging from 8 to 30 hours. Two pilot granular media filters were operated at filtration rates ranging from 1.0 to 2.0 l/sec/square meter. The filters were operated in both downflow and upflow modes, with various media used in each operational mode. The pilot settling ponds did not perform as expected. Anaerobic conditions, which developed in the settled sludge, disrupted the floc structure and resuspended previously settled solids. Very modest improvement in final effluent quality, generally less than 25%, was observed. The two filters when operating in a downflow mode with two different configurations of anthracite and sand media, proved about equal in performance, achieving 65-86% incremental removals of suspended solids. Upflow filter operation produced a slightly lower effluent quality, but resulted in lower rates of headloss buildup and substantially longer filter runs. (Moore-SRC)
W81-01436

JET AERATION CHANNEL SYSTEM,
Houdaille Industries, Inc., Fort Lauderdale, FL.(Assignee).
M. G. Mandt.
U.S. Patent No 4,199,452, 14 p, 7 Fig, 1 Tab, 9 Ref; Official Gazette of the United States Patent Office, Vol 933, No 4, p 1372-1373, April 22, 1980.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Sewage treatment, Activated sludge, Oxidation, Flow control, Aerobic treatment.

This invention is directed to aerobic waste water treatment systems having improved energy requirements, which can be adapted to efficiently compensate for diurnal or other variations in sewage flow that are commonly found in medium size sewerage treatment plants. The system comprises an oxidation ditch for confining and retaining the waste liquid and defining a continuous closed flow path through which the confined liquid is moved, a first raw waste pump activated by an intermediate level of raw waste received, a second raw waste pump activated by a high level of raw waste, a first blower activated during operation of either first or second raw waste pumps, gas-liquid contactors for receiving raw waste from either or both raw waste pumps and air from the first blower and for discharging a high velocity raw waste liquid-air jet or mixed liquor into the oxidation ditch below the surface. (Sinha-OEIS)
W81-01443

SPLIT FLOW WATER TREATMENT PLANT,
Neptune Microfloc, Inc., Corvallis, OR. (Assignee).
For primary bibliographic entry see Field 5F.
W81-01445

PROCESS FOR SEPARATING AQUEOUS MINERAL ACID MIXTURES,
Monsanto Co., St. Louis, MO. (Assignee).
R. Chiang, and E. Perry.
U.S. Patent No 4,199,445, 8 p, 5 Ref; Official Gazette of the United States Patent Office, Vol 993, No 4, p 1370-1371, April 22, 1980.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Separation techniques, Acids, Membrane processes, Water vapor, Product concentration.

The separation of components, one of which is water, such as formaldehyde and water, in order to

obtain a more highly concentration solution by removing at least a portion of the water from the feed solution is described. The process comprises contacting the feed mixture against one side of an ionic organic membrane, composed of organic polymers having active anionic groups derived from acids, and withdrawing at the second side a mixture having higher concentration of water. It is also essential that the mixture at the second side be maintained at a lower chemical potential than the feed side. It is also essential that the product be withdrawn at the second side in the vapor state. Multistate operation may also be feasible since this permits the operation of individual stages at various concentrations and temperatures in order to achieve the optimum driving forces for the process. (Sinha-OEIS)
W81-01448

PROCESS FOR DECOLORIZING PULP AND PAPER MILL WASTE WATER,
Sybron Corp., Rochester, NY. (Assignee).
J. E. Blair, and L. T. Davis.
U. S. Patent No 4,199,444, 6 p, 9 Tab, 4 Ref; Official Gazette of the United States Patent Office, Vol 993,, No 4, p 1370, April 22, 1980.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Industrial wastes, *Pulp and paper industry, Bleaching wastes, Color, Aerobic conditions, Microorganisms, Pseudomonas aeruginosa.

The object of this invention is to provide a biological process for the treatment of pulp and paper mill waste water effluent to not only remove biodegradable organic matter, but to specifically reduce or decolorize the waste water. The biological treating process uses a mutant strain of Pseudomonas aeruginosa. The mutant microorganism does not require the addition of carbohydrates to the system and is well adapted to biological treatment systems. (Sinha-OEIS)
W81-01449

INSTALLATION FOR TREATMENT OF SEDIMENTS COMING FROM STATIONS FOR PURIFICATION OF INDUSTRIAL WASTE WATER,
Regie Nationale des Usines Renault, Boulogne-Billancourt (France). (Assignee).
For primary bibliographic entry see Field 5E.
W81-01452

APPARATUS FOR REMOVING SUSPENDED OIL DROPLETS FROM WATER.
Exxon Production Research Co., Houston, TX. (Assignee).
R. E. Williams.
U. S. Patent No 4,198,300, 6 p, 1 Fig, 7 Ref, Official Gazette of the United States Patent Office, Vol 993, No 3, p 986, April 15, 1980.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Oily water, Oil pollution, Separation techniques, Bubbles, Coalescence, Equipment, Offshore drilling.

Suspended droplets of oil are separated from a waste water stream by injecting the oil and water mixture into a partially submerged, vertical pipe. Gas bubbles injected into the lower end of the pipe rise through the pipe and countercurrently contact the suspended oil droplets, thereby promoting the separation of the droplets from the waste water. The oil droplets coalesce and form a separate oil layer on top of the waste water which is readily withdrawn while clarified waste water is discharged from the lower end of the pipe. If employed to separate oil from a waste water stream on an offshore rig, the vertical pipe is submerged adjacent to the rig. (Sinha-OEIS)
W81-01454

MICROSCREEN METHOD AND APPARATUS,
Water Pollution Control Corp., Milwaukee, WI. (Assignee).
L. Ewing, and M. J. Bykowski
U.S. Patent No 4,198,299, 23 p, 18 Fig, 1 Tab, 4 Ref; Official Gazette of the United States Patent Office, Vol 993, No 3, p 985-986, April 15, 1980.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Separation techniques, Equipment, Vapor pressure, Suspended solids, Flow rates, Gas pressure, *Microscreening.

A limited differential gas pressure is applied across an unsubmerged portion of the screening cloth of a microscreen unit, while rotating the drum, screening and backflushing. Thus, the invention is distinguishable from pressure filtering techniques in which pressure is applied against the submerged area of a filter by pressurizing a confined body of liquid against a filter cake. The invention provides advanced methods and apparatus which are of particular interest for dealing with agglomerated solids. These involve: applying the differential pressure only during periods of peak load on the microscreen, and/or boosting shower pressure during at least a substantial portion of the time during which the differential pressure is being applied and/or off-setting, inhibiting or preventing the application of the applied differential pressure in the zone above the collection means. Drop-back of solids into the drum pool is reduced and the invention enables operation at increased flow capacity. (Sinha-OEIS)
W81-01455

SYSTEM AND APPARATUS FOR CONTROL AND OPTIMIZATION OF FILTRATION PROCESS,
Enviro Development Co., Inc., Mountain View, CA. (Assignee).
M. M. Zuckerman, and L. C. Hamer.
U.S. Patent No 4,198,298, 9 p, 2 Fig, 5 Ref; Official Gazette of the United States Patent Office, Vol 993, No 3, p 985, April 15, 1980.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Control systems, Sludge, Flow control, *Filtration, Monitoring, Regulation, Equipment.

A process control apparatus and system for dewatering a solids ladened slurry of water and waste water employs one or more of four primary process control techniques, depending upon the particular process application. The four process control techniques are: (1) monitoring of the instantaneous solids concentration increase in the dewatering unit, (2) measurement of the rate of change of the solids concentration increase with respect to time, (3) controlled pumping to produce a substantially constant flow rate in the effluent from the dewatering unit until the terminal dewatering pressure is reached, and (4) variation of the amount of conditioning agents added to the influent slurry in response to one or more control signals derived from other components of the dewatering system and apparatus. (Sinha-OEIS)
W81-01456

REMOVAL OF TRACE COPPER IONS FROM WATER,
Office of the Secretary (Interior), Washington, DC. (Assignee).
E. Valdes-Krieg, J. King, and H. H. Sephton.
U.S. Patent No 4,198,297, 5 p, 1 Fig, 5 Ref; Official Gazette of the United States Patent Office, Vol 993, No 3, p 984-985, April 15, 1980.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Industrial wastes, Metals, Separation techniques, Surfactants, Foam fractionation, Copper, Product recovery.

A method for separation and recovery of metal ions, particularly copper ions, from dilute aqueous solutions by means of a bubble fractionation process employs countercurrent contacting of the feed solution with a stream of gas bubbles and a surface-active agent. This is achieved by utilization of an elongated vertical fractionation column, with feed solution being continuously introduced near the top of the column, and the gas bubbles and surfactant being continuously introduced near the bottom of the column. Surfactant loading at the gas-liquid interface substantially throughout the length of the column is thereby obtained, resulting in improved separation of metal ions from solution in association with the surfactant. (Sinha-OEIS)
W81-01457

PROCESS FOR INCREASING THE EXCHANGE YIELD IN ION EXCHANGE PROCESSES.
Sandor Vajna (Germany, F.R.). (Assignee).
S. Vajna.
U.S. Patent No 4,198,295, 14 p, 7 Ref; Official Gazette of the United States Patent Office, Vol 993, No 3, p 984, April 15, 1980.

Descriptors: *Patents, *Waste water treatment, *Desalination, Demineralization, Separation techniques, *Ion exchange, Industrial water, Product recovery, Regeneration.

A process is described for increasing the exchange yield in ion exchange processes. According to the invention, salt-containing waste waters are formed at two locations: with the commencement of the exchange reaction, the ion loss makes up about 2 to 10% of the ion content of the solution supplied from outside, and finally about 0.2 to 4%. These ions are once again found in the secondary waste water leaving the system. For the purpose of eliminating these ions, it is proposed to admix the dilute solutions obtained in addition to the product with the water which is to be treated, as a result of which its salt content increases about 3 to 15%. This causes a corresponding higher consumption of regenerating agent, but the result is thereby obtained that only the concentration is only slightly lower than that of the solution supplied from outside, and the treated water, which can be discarded or used again without any difficulties, emerge from the system. The process can be used not only in connection with treatment of waste water, but also in connection with the removal of salt from brackish water and in connection with the softening or demineralization of raw or untreated water. It is also possible to use the process for the production of chemical products. (Sinha-OEIS)
W81-01459

WATER PURIFICATION SYSTEM,
Redux Corp., Inc., St. Louis, MO. (Assignee).
T. N. Deane.
U.S. Patent No 4,198,294, 8 p, 2 Fig, 14 Ref; Official Gazette of the United States Patent Office, Vol 993, No 3, p 984, April 15, 1980.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Separation techniques, Industrial wastes, Water reuse, Emulsions, Surfactants, Foam separation, Detergents, *Water purification, Laundry industry.

Waste water from a washing operation is reclaimed for re-use by emulsifing with a water insoluble (or oil soluble), high molecular weight, anionic surface active oil, then breaking the emulsion by physical or chemical methods, thereby producing a coherent floc which occludes insoluble matter suspended in the water, then separating the floc from the purified water in a coherent mass. (Sinha-OEIS)
W81-01460

WASTE WATER TREATMENT IN THE MEDITERRANEAN ZONE: STUDY OF VARIOUS SOLUTIONS USED ON THE FRENCH COAST. (PROBLEMES POSES PAR L'EPURATION DES EAUX RESIDUAIRES URBAINES EN ZONE MEDITERRANEENNE -- ETUDE DE DIVERSES SOLUTIONS APPLIQUEES SUR LA COTE FRANCAISE.),
Societe, Rueil-Malmaison (France). Dept. de Recherches Biologiques.
J. Bebin, and J-C. Jacquart.
Progress in Water Technology, Vol 12, No 1, p 403-417, 1980. 4 Fig, 1 Tab, 9 Ref.

Descriptors: *Municipal wastes, *Tertiary treatment, *Sewage treatment, Planning, Regulation, Cities, Tourism, Facilities, Mediterranean, *France.

Several waste water treatment plants on the Mediterranean coast of France are described which utilize various methods to meet French regulations. Physical-chemical treatment has been successful at Cannes and at other sites where available land is limited due to development and tourism. Where fluctuating population levels are a problem, a combination of physical-chemical treatment under peak loading conditions with biological treatment at low or medium loadings is suggested. Advanced treatment may be required in some cases. There is a pilot plant at Montpellier which disinfects thoroughly treated effluent, and in Nice-Lingostiere, advanced tertiary treatment is necessary. Thus, treatment solutions can be found for all areas in spite of problems posed by tourism, geographic location, and socio-economic conditions. (Small-FRC)
W81-01472

EFFECT OF CARBON, AMMONIA NITROGEN AND HYDRAULIC LOADING RATES, RPM, AND EXPOSED SURFACE AREA VARIATIONS ON RBC PERFORMANCE,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
G. E. Hoag, and W. H. Hovey.
In: First National Symposium on Rotating Biological Contactor Technology Proceedings, June, 1980, p 103-117. 9 Tab, Army Construction Engineering Research Laboratory, P.O. Box 4005, Champaign, Ill. OWRT A-081-CONN(1), 14-34-0001-0107.

Descriptors: *Rotating biological contactor, Biological waste treatment, Factorial analyses, Effects of process variation, *Waste water treatment, Performance, Limiting factors, Effects, Carbon, Ammonia nitrogen, Hydraulic loading rates.

Basic and independent factors which possibly effect rotating biological contactor (RBC) effluent quality and performance are hydraulic flow rate, carbon mass flow rate, ammonia nitrogen mass flow rate, percent of disc area exposed to the atmosphere at any given time, and disc revolutions per minute (RPM). These factors were studied in this experimental program. Influent concentrations were not chosen as variables for study because they are not basic factors, but are derived factors, equal to mass flow rates divided by hydraulic flow rates.
W81-01476

MICROFAUNA AND RBC PERFORMANCE: LABORATORY AND FULL SCALE SYSTEMS,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
G. E. Hoag, W. J. Widmer, and W. H. Hovey.
In: First National Symposium on Rotating Biological Contactor Technology Proceedings, June, 1980, p 167-187. 4 Fig, 8 Tab. Army Construction Engineering Research Laboratory, P.O. Box 4005, Champaign, Ill. OWRT A-081-CONN(2), 14-34-0001-0107.

Descriptors: Biological wastewater treatment, Protozoa, *Rotating biological contactor, Microbial ecology, *Waste water treatment, *Biological treatment, Bacteria, Ecology, Ecosystems, *Microfauna.

The transformation of soluble substrate to cells, metabolic products and excreta is the basis of the rotating biological contactor process. Metabolic activities associated with the rotating biological contactor occur in fixed-film, or as they are more commonly termed, biofilm cultures. Bacterial populations exist as a response to combinations of various environmental factors. The sum of all these factors constitute, in an ecological sense, a niche, or a specialized environment suitable for microbial occupation. These saprophytic bacteria are in turn predated by holozoic organisms such as the Phyla: Protozoa, Rotifera and Nematomorpha. Some members of these Phyla may prey upon either bacteria, algae or other members of the above mentioned Phyla. Thus, the niches for these organisms are defined by the presence of other organisms as well as environmental factors.
W81-01477

EFFECT OF PRETREATMENT ON THE FILTRATION OF LOW TURBIDITY SECONDARY EFFLUENT,
Los Angeles County Sanitation Districts, Whittier, CA.
L. S. Directo, C. Chen, and R. P. Miele.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-111031, Price codes: A05 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/2-80-148, August, 1980. 85 p, 29 Fig, 11 Tab, 13 Ref. 14-12-150.

Descriptors: *Waste water treatment, *Coagulation, *Filtration, *Suspended solids, *Turbidity, Waste water(Pollution), Costs, Activated sludge, Chemical precipitation, Sewage treatment, Filters, Polymers, Alum.

Removal of residual suspended solids after biological treatment is one of the proven procedures for upgrading waste water treatment plant performance. A 17-month pilot plant study evaluated the relative effectiveness of two types of pretreatment scheme on the performance of multimedia pressure filters in the removal of turbidity, suspended solids, and other associated pollutants from an activated sludge plant effluent. The two types of filter pretreatment schemes studied were a conventional chemical coagulation-sedimentation system and an in-line coagulation system. In both pretreatment schemes, alum and polymer were used. The turbidity removal performance was essentially the same for both dual media and mixed media pressure filters, but the headloss levels across the mixed-media filter were consistently higher than those observed in the dual media filter. The study demonstrated that for a low turbidity secondary effluent, an in-line coagulation pretreatment is feasible and results in significantly lower overall capital and operating costs than that of a conventional pretreatment system. Moreover, it was observed from limited filtration data that without chemical addition, the resulting filter effluent turbidity levels were comparable to those obtained in filters with an in-line coagulation pretreatment system operated at optimum doses of alum and polymer. The lengths of filter run with an in-line coagulation pretreatment were consistently shorter than those observed without chemical addition or with a chemical coagulation-sedimentation pretreatment. (Moore-SRC)
W81-01481

SUMMARY OF LONG-TERM RAPID INFILTRATION SYSTEM STUDIES,
Robert S. Kerr Environmental research Lab., Ada, OK.
L. E. Leach, C. G. Enfield, and C. C. Harlin, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB80-222086, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/2-80-165, July, 1980. 59 p, 7 Fig, 12 Tab, 12 Ref.

Descriptors: *Waste water treatment, *Municipal wastes, *Infiltration, Water pollution, Metals, Iron, Phosphorus, Groundwater, Pesticides, Lindane, Environmental sanitation, Rapid infiltration systems.

Evaluation of four long-term rapid infiltration municipal waste water systems indicates that they are generally operating in conformance with current criteria published in the Process Design Manual for Land Tretment of Municipal Waste waters as well as the proposed design rationale. Two of the systems were applying primary pretreated waste water to infiltration beds and two were applying secondary pretreated waste water. Comparison of treatment efficiency of infiltration beds indicated a higher percentage of removal for selected parameters in the systems with primary pretreatment. Lake George, New York, and Hollister, California, demonstrated exceptional capability for nitrogen removal through the soil treatment systems. Both of these systems were managed using well scheduled wetting and drying cycles. Phosphorus concentration was reduced at each of the treatment sites. Iron appears to be leaching from the profile at all sites, possibly due to reducing conditions developed during flooding cycles. Generally the other metals did not indicate significant differences in concentration between the waste water applied and that reaching the shallow groundwater. The pesticides that were detected in the waste waters were all found in the shallow groundwater, indicating these pesticides are mobile in the soil profile. Lindane was the only pesticide found significantly elevated over background groundwater concentrations. (Moore-SRC)
W81-01485

HUMIC SUBSTANCES REMOVAL BY ACTIVATED CARBON,
Illinois Univ., Urbana-Champaign. Dept. of Civil Engineering.
M. C-Y. Lee, and V. L. Snoeyink.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-163552, Price codes: A07 in paper copy, A01 in microfiche. Water Resources Center, University of Illinois, Research Report 153, November, 1980. 125 p, 43 Fig, 12 Tab, 52 Ref. OWRT-B-110-ILL(1), 14-34-0001-8083.

Descriptors: *Activated carbon, *Adsorption, *Water treatment, *Environmental engineering, *Humus, Organic compounds, Fulvic acids, Humic acids, Chloroform, Haloforms, Coagulation-sedimentation.

Humic substances are a major concern to the water treatment industry because they can cause odor and color problems and are potentially toxic and/or carcinogenic. A humic acid and a fulvic acid were used to evaluate the removal of humic substances by various activated carbons. Different analytical methods were investigated to measure the concentration of humic substances and their chloroform potential. Total organic carbon measurement and ultraviolet/visible adsorbance correlate well with the chloroform potential of humic substances. Pore size distribution was the most important physical characteristic of activated carbon for adsorption of humic substances. A decrease of pH in solution, lower molecular weight fractions of humic substances, smaller carbon particles, and the presence of soluble alum were found to increase carbon adsorption. Chemical pretreatment with alum increased the adsorption capacity of carbon almost three-fold. The application of a mathematical model to predict the performance of the carbon bed for the adsorption of humic substances was successful. In general, this model is sensitive to values of adsorption capacity of activated carbon and the surface coefficient of humic substances inside the adsorbent particle. The higher the adsorption capacity, the lower the diffusion coefficient. Based on the model predictions, the empty bed contact time of the carbon bed and the influent concentration were the two most important factors in designing a carbon bed for humic substance removal.
W81-01491

THE REMOVAL OF LOW LEVELS OF PHENOL BY ACTIVATED CARBON IN THE PRESENCE OF BIOLOGICAL ACTIVITY,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
W. A. Chudyk, and V. L. Snoeyink.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-163560, Price codes: A06 in paper copy, A01 in microfiche. Water Resources Center, University of Illinois, Research Report No 154, January, 1981, 110 p, 22 Fig, 9 Tab, 94 Ref. OWRT-B-110-ILL(2), 14-34-0001-8083.

Descriptors: *Water treatment, *Phenols, *Activated carbon, *Biological treatment, Potable water, Biological oxidation of phenol, Phenol removal, Waste water purification, Water reuse.

Bioregeneration of activated carbon was shown to occur in bench-scale carbon columns through use of parallel bacterially seeded and non-seeded, non-bioactive columns. Phenol degrading organisms were taken from an enrichment using phenol as sole carbon source. Mass balance calculations on phenol and dissolved oxygen were used to estimate

amounts of pre-adsorbed phenol being biodegraded under different conditions, with a check made on this amount through the use of adsorption isotherm analysis. The amount of bioregeneration was found to be related to the influent dissolved oxygen concentration. Transient organic load experiments showed that the presence of a bacterial population could affect the effluent concentrations resulting from such transient loadings primarily through two mechanisms: increased carbon capacity due to bioregeneration, and reduction of solution concentration due to biodegradation of phenol in the bulk solution. End product analysis was performed via carbon extraction, gas chromatography, and mass spectroscopy. Total organic carbon analysis of column effluents was also performed.
W81-01492

FEASIBILITY OF PURIFICATION AND CONCENTRATION OF SELECTED WASTE WATER STREAMS BY ULTRAFILTRATION,
Mississippi State Univ., Mississippi State. Dept. of Chemical Engineering.
N. Espinoza.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-163610, Price codes: A05 in paper copy, A01 in microfiche. MS Thesis, August, 1980. 68 p, 13 Fig, 24 Tab, 37 Ref. OWRT-A-130-MISS(2), 14-34-0001-0126.

Descriptors: *Waste water treatment, *Filtration, *Organic wastes, *Ultrafiltration, Waste water purification, *Pulp and paper industry, Concentration of waste water, High molecular weight organic wastes, COD, Wood sugars, Membrane processes, Cheese whey, Prehydrolysate, Amicon ultrafiltration unit.

Waste water streams in pulp and paper mills, hardboard plants and cheese whey processing plants often contain significant amounts of high molecular weight organic matter which place a heavy load on the waste water treatment facilities. The purpose of this work was to determine, on a lab scale, the feasibility of using ultrafiltration (UF) to purify and concentrate these wastes. The chemical oxygen demand (COD) reduction of the cheese whey, prehydrolysate and wood sugars permeates ranged from 92 to 97% of the initial values. The initial COD values of 60,000 ppm, 130,000 ppm and 119,000 ppm were reduced to less than 2,000 ppm, 6,000 ppm and 9,000 ppm, respectively. Ultrafiltration was found to be an effective process for purification and concentration of waste water streams. Because of its conceptual simplicity and low energy consumption, the UF membrane process offers an economically attractive solution for treating waste from pulp and paper mills, hardboard plants, and cheese processing plants.
W81-01497

MICRO-ORGANIC COMPOUNDS IN THE WATER ENVIRONMENT AND THEIR IMPACT ON THE QUALITY OF POTABLE WATER SUPPLIES,
Water Research Commission, Pretoria(South Africa).
For primary bibliographic entry see Field 5C.
W81-01505

WASTE WATER DISINFECTION - TOWARD A RATIONAL POLICY,
Johns Hopkins Univ., Baltimore, MD. School of Hygiene and Public Health.
K. Kawata, V. P. Olivieri, and C. W. Kruse.
Journal of the Water Pollution Control Federation, Vol 52, No 2, p 416-420, February, 1980. 1 Fig, 1 Tab, 8 Ref.

Descriptors: *Water treatment, *Disinfection, *Salmonella, Water quality control, Water purification, Environmental engineering, Chlorination, Environmental sanitation, Public health, *Waste water treatment, Maryland, Baltimore(MD), Black River Treatment Plant(MD).

A study was made of Salmonella and the traditional indicator organisms in the raw waste water and in the chlorinated and unchlorinated plant effluents of the Black River Waste water Treatment Plant of Baltimore City. Waste water samples were held for 14 days and assayed at time intervals to establish the survival patterns of the organisms, in order to supply a reasonable data base for microbial load to downstream water uses. The findings demonstrated that Salmonella may be discharged to receiving waters if the effluent from a conventional waste water treatment plant is not disinfected. This fact, coupled with data demonstrating that underestimation of the concentration of Salmonella is likely to occur, plus the knowledge that techniques for monitoring many pathogens still are being developed, suggests that prudence and caution be exercised and that all plant effluents be disinfected. Exceptions would be only on a case-by-case basis, where it can be shown that the health of the public is not threatened. (Baker-FRC)
W81-01508

WATER RESOURCES FOR CHICAGO-HISTORY AND FUTURE,
Metropolitan Sanitary District of Greater Chicago, Chicago, IL.
F. C. Neil, and F. E. Dalton.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol 106, No WR1, p 173-184, March, 1980. 5 Fig, 1 Tab, 2 Ref.

Descriptors: *Waste water treatment, *Storm drains, *Chicago, Reviews, Water pollution, Sewage treatment, Tertiary treatment, Lake Michigan, Storm runoff, Tunnels, Treatment facilities, Sanitary engineering, Public health, Future planning, Aeration, Municipal wastes, Water management, Cities, Chicago River.

A review of Chicago's management of its water resources is presented, with emphasis on measures taken to handle a rapidly increasing population. The Sanitary District of Chicago has increased from its original 409 sq km to 2,243 sq km. When the US Supreme Court declared in 1930 that Illinois was taking more than its share of water from Lake Michigan, Chicago began expansion of its sewage treatment program. Previous attempts to control public health problems from sewage included the reversal of the Chicago and Calumet Rivers away from this Great Lake. The history of pollution problems in the city is reviewed from the time of the city's settlement in the 17th century to the present. The main source of pollution of the Chicago River and Lake Michigan was from untreated sewage discharged from the city. The Metropolitan Sanitary District of Greater Chicago now has 3 major secondary treatment plants and maintains rigid controls over private and industrial treatment systems. Often, low flow rates in the District's waterways cause serious decreases in the levels of dissolved oxygen. Storm runoff usually overloads the sewage systems, and the overflow into the two rivers must be released into Lake Michigan. Pollution of the lake often forces the recreational beaches to close. A ten year plan to improve water quality in the Sanitary District includes building instream aeration systems, upgrading major sewage treatment plants to tertiary treatment, and furnishing an extensive tunnel and reservoir system to handle storm overflows. Attempts will also be made to eliminate backflows to Lake Michigan, which will prevent pollution of this water body by the city. (Geiger-FRC)
W81-01509

DECLINING-RATE VERSUS CONSTANT-RATE FILTRATION,
Sao Paulo Univ. (Brazil). Dept. of Hydrology and Sanitation.
L. Di Bernardo, and J. L. Cleasby.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 106, No EE6, p 1023-1041, December, 1980. 11 Fig, 3 Tab, 13 Ref.

Descriptors: *Filtration, *Flow rates, Performance, *Water treatment, Waste water treatment, Turbidity, On-site investigations, Equipment, Flow profiles, Declining rate filtration, Backwash, Pressure head.

The advantages of a declining rate system were demonstrated when declining rate filtration was compared to constant rate filtration at three filtration rates: 3 gal/min/sq ft, 5 gal/min/sq ft, and 7 gal/min/sq ft. The declining rate system produced an average filtrate turbidity which was consistently and substantially better than that of the constant rate system. The declining rate system produced 30-60% lower average filtrate turbidity. The poorest effluent quality of the declining rate system occurred after backwashing one filter, and the highest filtration rate occurred on the cleanest filter remaining in service during the backwashing operation when water reached its maximum level. The filtration rates in the individual filters of the declining rate system remained constant between backwashings and declined in a stepwise fashion after each backwash. (Small-FRC)
W81-01532

ROTATING-DISC BIOLOGICAL TREATMENT OF ACID MINE DRAINAGE,
Tennessee Valley Authority, Chattanooga.
H. Olem, and R. F. Unz.
Journal of the Water Pollution Control Federation, Vol 52, No 2, p 257-269, February, 1980. 10 Fig, 6 Tab, 17 Ref.

Descriptors: *Acid mine water, *Mine drainage, *Biocontrol, Acidic water, Mine water, Water types, Acid streams, Mine wastes, Biological treatment, Water treatment, *Waste water treatment.

The study was conducted to determine whether naturally occurring bacteria in acid mine drainage (AMD) would effectively and efficiently oxidize Fe2+. Specific objectives of the study included the treatment of AMD of contrasting physical, chemical and microbiological characteristics; a comparative performance evaluation of different size rotating biological contactor (RBC) units for determining potential scale-up problems in design and operation of the process; and requirements for treating specific drainages and necessary modifications to accomplish desired effluent quality. Under all conditions tested the continuous microbiological oxidation of Fe2+ to less soluble Fe3+ was accomplished. Mine-water temperatures as low as 0.4 degrees C reduced but did not stop Fe2+ oxidation in field RBC units. The 0.5 m RBC unit produced an average of 10% higher Fe2+ oxidation efficiency than the 2.0 m unit. No relation was noted between Fe2+ oxidation efficiency and influent pH over the pH range of 2.18 to 5.50. Lower influent Fe2+ in Hollywood mine drainage (71.6 mg/l) resulted in a higher oxidation efficiency at equilibrium for the 2.0 m prototype RBC (95.7%) as compared with the treatment efficiency when mine water contained about twice the influent Fe2+ content (90.5%). Under similar operating conditions, Fe2+ oxidation efficiencies in the treatment of Hawk Run mine waters with the RBC field units were 10 to 15% lower than treatment efficiencies observed with Hollywood mine drainage, which may be due to differences in the nature of disc solids. (Baker-FRC)
W81-01540

START-UP PROBLEMS AT A PLANT TREATING FOOD-PROCESSING WASTEWATER,
Metcalf and Eddy, Inc., Boston, MA.
E. L. Stover.
Journal of the Water Pollution Control Federation, Vol 52, No 2, p 249-256, February, 1980. 5 Fig, 6 Ref.

Descriptors: *Food processing industry, *Waste water treatment, Industries, *Industrial wastes, Pollutants, Activated sludge, Operations, Carbohydrates, Slime.

Operational difficulties associated with the start-up of an industrial wastewater pretreatment plant treating a highly variable carbohydrate wastewater by the complete-mix activated sludge process are described. The operation consists of wastewater neutralization, two dissolved air flotation units, a complete-mix equalization basin, a complete-mix aeration basin, a final clarifier, and an aerobic digester. The system functions as a two-stage system, with the equalization basin also serving as the first stage of biological treatment. High point in both wastewater flow and organic load correspond

to cleanup operations at the end of the production week. Two major problems caused by the organic shock loading conditions were encountered during the start-up of the plant. The fluctuations in wastewater flow rate did not present operational problems, as these changes could be handled by the equalization basin while a constant flow to the aeration basin was maintained. During nitrogen-deficient conditions in the equalization basin caused by doubling of the organic loading, bacterial cell replication was retarded, and the bacteria capable of producing extracellular polysaccharide began producing large amounts of polysaccharide slime. The equalization basin was reseeded with biological sludge from the aeration basin and with domestic treatment plant sludge to reduce the slime biologically. (Baker-FRC)
W81-01541

SELECTED ORGANIC PESTICIDES, OCCURRENCE, TRANSFORMATION, AND REMOVAL FROM DOMESTIC WASTEWATER,
North Texas State Univ., Denton.
F. Y. Saleh, G. F. Lee, and H. W. Wolf.
Journal of the Water Pollution Control Federation, Vol 52, No 1, p 19-28, January, 1980. 3 Fig, 7 Tab, 16 Ref.

Descriptors: *Waste water treatment, *Chlorophenoxy herbicides, *Pesticides, Chlorinated hydrocarbon pesticides, Activated carbon, Aldrin, 2,4-D, Dieldrin, DDT, Water pollution, Domestic water, Domestic wastes.

Results are presented of a study on the occurrence, transformation, and removal of chlorinated hydrocarbon pesticides (CHP) and chlorophenoxy herbicides (CPH) from Dallas, Texas municipal wastewater. The pilot plant used in the study includes two completely mixed activated sludge units (aeration basins and final clarifiers), a chemical treatment module, two mixed-media filters, and two activated carbon columns. Throughout the study period, electron capture gas chromatography of the wastewater demonstrated the resolution of 20 to 25 peaks having relative retention time (Rr) values less than 1.3. Only minor changes were noted in the number of peaks during the study period. The finding of the same characteristic fingerprints in higher magnitude in extracts of raw and treated wastewater indicates the refactory nature of the organic pesticide and herbicide residues and indicates that each area has a profile characteristic of the activities which infiltrate the system. Confirmation in wastewater was attained for aldrin, dieldrin, o,p'-DDT, p,p'-DDT, 2,4-D alkyl esters, and inorganic salts of 2,4-D. The chlorinated hydrocarbons aldrin, dieldrin, and DDT compounds represent only a minor fraction of the CHP residues. The major part was the 2,4-D compounds, which are commonly used in lawn and aquatic weed control. The results of the study indicate that activated sludge treatment of wastewater under nitrifying conditions effected only limited removal of these organic residues as detected on EC chromatograms. (Baker-FRC)
W81-01543

HYDRAULIC CONSIDERATIONS IN DECLINING-RATE FILTRATION,
Iowa State Univ., Ames.
J. L. Cleasby, and L. Di Bernardo.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 106, No EE6, p 1043-1055, December, 1980. 4 Fig, 7 Ref.

Descriptors: *Filtration, *Flow rates, Turbidity, Filters, Equipment, Head loss, Flow profiles, Water treatment, *Waste water treatment, Declining rate filtration, Pressure head.

The six most common hydraulic questions are answered for declining rate filtration systems. Declining rate filtration can be used as a flow system for granular bed gravity filters in water and waste water treatment plants. Head loss for the system is the sum of the clean filter head loss when the filters have dropped to level 2 after the backwash of one filter, plus the rise in level which occurs between backwashes from level 2 to level 3, and the rise in level which occurs during the backwash of one filter. Excessive rates of filtration through a clean filter are prevented by a flow restricting orifice or a fixed position valve. Predicted water level variations are presented, and the effect of turbulent head loss on filter operation is discussed. A declining rate system can operate with low turbulent head loss if the maximum water level is limited to avoid excessive rates on a clean filter. Declining rate can be operated under varying plant load by washing filters at various times throughout the day. Full understanding of the declining rate system should make it more common. (Small-FRC)
W81-01550

EFFECTIVENESS OF LAND APPLICATION FOR PHOSPHORUS REMOVAL FROM MUNICIPAL WASTE WATER AT MANTECA, CALIFORNIA,
Cold Regions Research and Engineering Lab., Hanover, NH.
I. K. Iskandar, and J. K. Syers.
Journal of Environmental Quality, Vol 9, No 4, p 616-621, October/December, 1980. 4 Fig, 4 Tab, 18 Ref.

Descriptors: *Waste water treatment, *Sorption, Soil treatment, Soil filters, Soil disposal fields, Phosphorus, Municipal wastes, *Phosphorus removal.

The effectiveness of removal of dissolved inorganic phosphate (DIP) from municipal waste water by slow infiltration systems such as the one at Manteca, California, is evaluated. The design flow rate at the sewage treatment plant is 9.5 million liters/day. When necessary, waste water is stored in a holding pond. Perennial ryegrass makes up the major vegetation of the area. Most of the waste water applied at the site infiltrates to the ground water table. While ground water flows in a southwesterly direction toward a river, it is likely that a substantial portion of the water is intercepted by a major drainage ditch that bounds the north, west, and south sides of the disposal area. Three sets of monitoring wells were installed during the initial construction. Samples were collected in June, September, and November of 1974 and again in February, May and July of 1977. DIP concentrations in soils that had received municipal wastewater for 4 and 13 yr ranged form 7.3 to 13.9 micrograms P/ml. The ability of the soil to remove added P was low. Only a small portion of the total P accumulated from waste water addition was in the organic form. Calcium chloride was able to remove large amounts of P from the upper 45 cm of the profiles receiving waste water. The very low P sorption capacity of the soil is regarded as the major factor for the poor performance of the Manteca system in terms of P removal from waste water. (Baker-FRC)
W81-01551

SEWER RENOVATION--SOLUTIONS FOR THE 80'S.
Water Services, Vol 84, No 1016, p 625-626, October, 1980. 1 Fig, 2 Tab.

Descriptors: *Insituform process, *Linings, *Sewers, *Pipes, *Rehabilitation, Costs, Repairing, Construction costs, Conveyance structures, Cost comparisons, Manholes, Comparative costs, Sewage disposal, District of Columbia, Dublin.

The most economical methods of renovating sewer systems involve relining existing pipes. After asbestos cement sewer pipes in a Dublin housing development were discovered not in compliance with local standards, the Insituform process was chosen to reline existing pipes and eliminate groundwater infiltration. The process used flexible, strong, and chemically inert pipe lining installed in sections and grouted in place. Although the inside diameter of the pipe was reduced by 12 mm, flow characteristics were improved by the smooth lining. Total costs of inspection, relining, etc. were 9,423 pounds compared with the estimated 25,000 pounds for reexcavating and replacing the defective system. Comparable work done in Washington, D. C., showed that pipes from 150 to 600 mm diameter were installed for about 50% of costs necessary to dig up and replace old pipes. (Cassar-FRC)
W81-01559

FLOW SPLITTING CONTROL,
A. M. Crossley.
Water Services, Vol 84, No 1016, p 608, 610, October, 1980. 3 Fig.

Descriptors: *Flow control, *Instrumentation, *Control systems, *Flow splitting, *Waste water treatment, Activated sludge, Flow measurement, Penstocks, Flowmeters, Remote control, Gradually varied flow, Inflow, Flow separation.

Flow splitting in a waste water treatment plant is an attempt to distribute the incoming flow equally to each treatment lane, even if the total flow varies. This differs from flow balancing, which attempts to maintain a constant flow to treatment throughout the day. Design of flow splitting equipment should consider flow measurement, flow control, flow-loop control, and flow splitting control. If traditional flowmeters are not suitable, there is an experimental device consisting of a Doppler sensor head and an ultrasonic level meter. Penstocks used in flow control may be modified by adding a remote actuator. Proper design of flow splitting control systems is based on diverting flow into appropriate channels rather than restraining it from channels. Although flow into the primary treatment plant is considered in this paper, the possibility of use in return of activated sludge is mentioned. (Cassar-FRC)
W81-01560

COST-EFFICIENT DESIGN SOLVES TOWN'S PROBLEM,
Camp, Dresser and McKee, Walnut Creek, CA.
S. Goodman, and D. Trumball.
Water and Wastes Engineering, Vol 17, No 11, p 31-35, 50, 51, November, 1980. 2 Fig, 3 Tab.

Descriptors: *Industrial wastes, *Municipal wastes, *Sludge treatment, Rotational flow, Inflow, Waste water treatment, Effluents, Sewage effluents, Primary treatment, Secondary treatment, Sewers, Drainage systems, Water quality control, Design, Infiltration, Crescent City(CA), California, Food processing industry.

A cost-efficient design for sewage system improvements in Crescent City, California, is described. The design addressed the problems of an overloaded primary treatment plant, an aging sewer system, a central urban location, waste discharge standards, and accommodation of nuisance wastes from seafood industries. The design consisted of a three-pronged plan, cost-effective in both capital outlays and continuing expense. An on-site pretreatment plan was developed for seafood wastes, which included hauling screened wastes to a landfill. Correction and repair of storm inflow sources accompanied by a surveillance program eliminated infiltration/inflow. The existing primary treatment facility was upgraded and expanded to include a secondary treatment process using rotating biological contactors and a two-stage sludge digester. This system has the benefits of simple operation, low power consumption, minimal maintenance requirements, good sludge settleability, potential for nitrification, control of odors, and the ability to handle shock loads and high industrial loads. (Titus-FRC)
W81-01569

WETLANDS IRRIGATION AIDS MAN AND NATURE,
T. C. Williams.
Water and Wastes Engineering, Vol 17, No 11, p 28-31, November, 1980. 2 Fig.

Descriptors: *Irrigation design, *Wetlands, *Marshes, Pilot plants, *Michigan, Operation and maintenance, Irrigation practices, Irrigation engineering, *Waste water treatment, Freshwater marshes, Wildlife, Game birds, Construction costs.

Two wetlands in Michigan, one natural and one artificial, are successfully used for irrigation of

treated effluent from waste water treatment facilities. During a 4 to 6 month irrigation season, an average of 85 million gallons per day of effluent containing 4 milligrams per liter of phosphorus, 0.6 milligrams per liter of ammonia and 5.4 milligrams per liter of nitrate nitrogen results in a high level of treatment. The wetlands require little or no maintenance, less isolation than spray irrigation areas, and have lower manpower and energy costs than conventional systems. This system has potential application for strip mines and other barren lands or areas lacking viable marsh habitat for recreational game. (Titus-FRC)
W81-01574

POLLUTION SOLUTIONS--THE CATIOPHORETIC PAINT INDUSTRY.
Effluent and Water Treatment Journal, Vol 20, No 10, p 506-507, October, 1980. 2 Fig.

Descriptors: *Paints, *Industrial wastes, *Froth flotation, *Water pollution treatment, Lead, Protective coatings, Coatings, Sewage treatment, Waste water treatment, Flotation, Flocculation, Coagulation, Foaming, Sludge, Separation techniques.

Catiophoretic paints used for electrocoating car and appliance bodies have a density near that of water, making sedimentation of the waste waters impractical. A flotation process has been developed which combines liquid-solid-gas phases in variable proportions. After coagulation and flocculation of the paint-contaminated water, air is added to the system by mixing with water previously saturated with air under pressure, producing microbubbles, 20-80 micrometers in diameter, upon controlled depressurization. These bubbles carry the particles to the surface, where they form a flocculated sludge. Treated effluent contained less than 3 mg per liter soluble lead, reduced from 250 mg per liter, and less than 100 mg per liter suspended solids. If paint concentration exceeds 1,500 mg per liter, prior dilution may be necessary. Sodium carbonate is used to raise the pH to prevent polymerization of the particles at the point of injection. (Cassar-FRC)
W81-01580

PERFORMANCE OF SOME OIL DISPERSANTS ON OIL SLICKS OF VARYING THICKNESS,
British Petroleum Co. Ltd., Sunbury-on-Thames (England).
D. G. Meeks.
Marine Pollution Bulletin, Vol 11, No 12, p 348-352, December, 1980. 6 Fig, 3 Tab, 1 Ref.

Descriptors: *Oil pollution, *Dispersion, *Water pollution treatment, *Emulsifiers, Ultimate disposal, Disposal, Biodegradation, Sea water, Laboratory tests, Water pollution sources, *Oil spills, Oil dispersants, Emulsions.

Effects of oil dispersants were studied on 50 g samples of a fuel oil-kerosine mixture in a laboratory apparatus based on a Perspex tank with agitation. This tank is similar in size to a household aquarium. The purpose of the study was to explore the possibilities of the method and to relate this work to the original method and to other laboratory testing procedures within the industry. Commerical dispersants such as BP 1100WD performed well. A 5-10 minute static soaking time using the dispersant as a 10% emulsion yielded low efficiencies. A soak time of at least 5 minutes improved effectiveness of BP 1100X. Doubling the film thickness (from 5 mm to about 10 mm) dropped the dispersing efficiency of BP 1100X on heavier oils to a level unlikely to be effective in real spill situations. However, the kerosine-fuel oil mixture dispersed even at a 12 mm thickness. Increasing the amount of dispersant applied to a slick increased performance. Possible procedures for practical spill situations are injection or booming and flooding of the slick and ruptured tanks with solvent based dispersants or use of aircraft to apply undiluted dispersant. (Cassar-FRC)
W81-01600

FORMATION, PREVENTION AND BREAKING OF SEA WATER IN CRUDE OIL EMULSIONS 'CHOCOLATE MOUSSES',
Shell Research B. V., Amsterdam (Netherlands).
A. L. Bridie, Th. H. Wanders, W. Zegveld, and H. B. Van Der Heijde.
Marine Pollution Bulletin, Vol 11, No 12, p 343-348, December, 1980. 8 Tab, 3 Ref.

Descriptors: *Oil spills, *Emulsions, *Water pollution treatment, Oil pollution, Water pollution sources, Emulsifiers, Chocolate mousses, Waste water treatment, Transportation, Sea water, Ships, Mousses, Laboratory studies.

'Chocolate mousses,' brown, highly viscous, stable emulsions of about 70% sea water in oil, are a result of shipping accidents and other releases of crude petroleum at sea. An emulsifier, designated LA 1834, was successful in laboratory scale and field trials as a 'mousse-breaking' chemical. During salvage and cleanup following an explosion aboard the tanker, Irene's Serenade, off the Greek coast, addition of 200-400 g of the additive per 200 liter drum reduced the viscosity so that the material was easily loaded and unloaded into disposal trucks. On storage, the emulsion lost much of its water content. The formation and properties of mousses were studied by making sea water emulsions with several crude oils and fractions. Emulsions formed by fractions with initial boiling points of 200 C were stable at 20 C and lower; those made with fractions with initial boiling points of 275 C were stable at 30 C and lower. Experiments showed that paraffin wax and asphaltenes were responsible for the stability of mousses. (Cassar-FRC)
W81-01601

RELATIONSHIP BETWEEN PHOSPHATE STRESS, EFFLUENT QUALITY, AND OBSERVED CELL YIELD IN A PURE-OXYGEN ACTIVATED-SLUDGE PLANT,
Gent Univ. (Belgium). Lab. for General and Applied Microbial Ecology.
W. Verstraete, and W. Vissers.
Biotechnology and Bioengineering, Vol 22, No 12, p 2591-2606, December, 1980. 4 Fig, 5 Tab, 14 Ref.

Descriptors: *Phosphates, *Activated sludge, *Oxygenation, *Industrial wastes, *Waste water treatment, Phosphorus compounds, Waste treatment, Organic wastes, Effluents, Sludge digestion, Operating costs, *Belgium.

An industrial waste treatment plant at the BP Chemicals Belgium Works was tested under 3 conditions--nonstress, continuous phosphate stress, and discontinuous phosphate stress-to determine the effects of these factors on sludge production and effluent quality. The system, which has a 3,000 cu m per day capacity, used pure oxygen in an activated sludge process with pH adjustments and ammonia and phosphate additions. Best results were produced by the discontinuous phosphate stress condition, in which the minimum daily phosphate dose was provided in two stages, at the initial stage and during a 3 hour period later in the day. Cell yield coefficient and sludge production was 45% below normal, and total operating cost reduction was 24%. The high quality effluent produced had excellent settling properties. Although the continuous phosphate stress conditions reduced sludge production by 36%, effluent quality was not improved. (Cassar-FRC)
W81-01606

SEPARATION OF URANIUM FROM NATURAL WATERS ON CHELEX-100 RESIN,
Australian Atomic Energy Commission Research Establishment, Lucas Heights.
P. Pakalns.
Analytica Chimica Acta, Vol 120, p 289-296, November, 1980. 1 Fig, 2 Tab, 9 Ref.

Descriptors: *Uranium, *Water analysis, Sea water, Analytical techniques, Ion exchange, Separation techniques, *Water treatment, Separation techniques.

Uranium can be separated from fresh and saline waters on Chelex-100 resin by adjusting the pH of the sample to 4.0 after addition of 1,2-diaminocyclohexanetetraacetic acid. After elution with 2 M nitric acid, uranium is determined either by the spectrophotometric 4-(2-pyridylazo)-resorcinol method (preferable for high levels) or the fluorometric method (preferable for microgram per liter levels). Phosphate at 25 to 500 micrograms does not interfere if thorium nitrate is added before the resin separation step. Best uranium recovery (93%) is obtained when the resin column is maintained at pH of 4.6 by addition of sodium acetate, acetic acid buffer. Surfactants, sodium tripolyphosphate, and complexing agents reduce recoveries to 84-91%. Vanadium interferes with the spectrophotometric method, but not the fluorometric method. Uranium was concentrated on the resin without prior acidification and with and without the complexing step at a recovery rate of 90%. Levels obtained were 3.5 and 3.4 micrograms per liter. (Cassar-FRC)
W81-01616

SEEKING A SOLUTION TO MULTIPLE SEWER PROBLEMS,
Wegman Engineers, New York.
G. R. Schevon.
Public Works, Vol 111, No 2, p 60-62, February, 1980. 3 Fig.

Descriptors: *Diversion tunnels, *Sewage treatment, *Interceptor sewers, Water pollution, *Waste water treatment, Tunnel design, Tunnel construction, Urban drainage, Storm runoff, Costs, Sewage effluents, Sanitary engineering, Model studies, Computer models, Sewage disposal, Environmental sanitation, *Buffalo(NY).

A study of the Buffalo Sewer Systems was initiated in 1970 to address the problems besetting the facilities serving 402,000 people. Raw sewage had been discharged into the Scajaquada Drain, the enclosed portion of Scajaquada Creek, for many years, causing pollution of the creek. A weir and an inlet grate structure were installed in the Drain to divert creek waters to an outfall sewer connected to the city's main interceptor. Water from sewage effluent discharged by Cheektowaga, Buffalo's upstream neighbor, was also intercepted by the treatment plant. Creek water also flowed into the Delaware Park Lake, a recreational lake downstream from the treatment plant, which had to be closed to the public in 1958 due to unsanitary conditions. Intrusion of waters from the Black Rock Canal and storm overflows also added to the treatment burden of the city's main plant. A Road Research Laboratory model, a computerized stormwater management model for highly urbanized areas, was applied to the problems of the Buffalo city sewage system. The master sewer plan which was developed recommended the transporting of raw sewage from Cheektowaga to Buffalo's new secondary treatment plant. It was also suggested that all sewage discharging into the Scajaquada Drain should be intercepted. To accomplish this, a tunnel interceptor was proposed which would carry sewage by gravity flow from the creek at the easterly city line to the Niagara Street interceptor at Squaw Island. The tunnel would be between 40-60 feet below the ground with a 9 foot diameter bore and a 9 inch concrete lining. Estimated costs of $34,750,000 would be covered by federal funding. Tunnel boring began in September of 1979 and completion of the project is anticipated early in 1981. (Geiger-FRC)
W81-01630

NO NONSENSE MANAGEMENT: KEY TO SUCCESSFUL WASTEWATER PLANT OPERATION,
Toledo, OH. Water Reclamation Div.
K. Keil, P. Munn, and H. Bhatt.
Public Works, Vol 112, No 1, p 61-64, January, 1981. 1 Fig.

Descriptors: *Activated sludge, *Administration, *Operation and maintenance, *Waste water treatment, Treatment facilities, Planning, Personnel, Performance, Municipal wastes, Industrial wastes, Ohio, *Toledo(OH).

Sound management techniques were used to improve the performance of the large waste water

treatment plant in Toledo, Ohio. Operation and maintenance costs were also reduced at the 100 mgd plant. The facility employs the activated sludge process and receives municipal wastes, storm water, and industrial wastes. A new commissioner of the division of water reclamation instituted a cost accounting system and a preventive maintenance program, made efforts to reduce chemical and energy consumption, began a training and safety program for division personnel, and let a new contract for sludge hauling and land spreading. These policies caused significant improvements over a period of two years. For example, four primary digesters were cleaned for the first time in ten years, resulting in a marked difference in digester operation. Also, to avoid breakdowns which had been common, the 10 primary and 11 secondary clarifiers are systematically cleaned and inspected twice a year. Operating costs were reduced in part by eliminating unnecessary personnel and controlling purchasing. (Small-FRC)
W81-01631

GAC WATER TREATMENT SYSTEMS,
Culp/Wesner/Culp, El Dorado Hills, CA.
R. L. Culp.
Public Works, Vol 111, No 2, p 83-87, February, 1980. 5 Fig, 1 Tab.

Descriptors: *Water treatment, *Operating costs, *Activated carbon, Pilot plants, Waste water treatment, Tertiary treatment, Potable water, Organoleptic properties, Color, Odor, Water treatment, Project planning, Organic compounds, Design data, Model studies, Safety factors, Taste, Public health.

Little design or cost data has been available on the granular activated carbon (GAC) treatment of public water supplies, a practice employed in approximately 46 cities of the United States for control of taste, odor, and color. Many of the problems encountered with GAC treatment have been mechanical. Five GAC performance studies are currently being sponsored by the EPA to yield GAC performance and cost data on reactivation at water supply installations. Twenty to thirty GAC plants for food processing will give insight to design and safety factors of the process and a similar number of facilities for industrial water pollution control will yield operation and cost data for this application of GAC systems. Pilot plant studies of GAC adsorptive and reactivation properties in municipal water treatment installations may be combined with known costs of GAC systems in waste water treatment to give design models and estimates of preliminary costs which are appropriate for developing new water treatment facilities. (Geiger-FRC)
W81-01632

BACTERIAL SUPPLEMENTATION AIDS WASTE WATER TREATMENT,
Arvada Public Works Dept., CO.
C. Gardner.
Public Works, Vol 111, No 3, p 71-72, March, 1980. 1 Tab.

Descriptors: *Waste water treatment, *Sewage bacteria, Lipids, Sludge digestion, Cultures, Odor, *Biological treatment, Industrial wastes, Biochemical oxygen demand, Colorado, Temperature, Trickling filters, Municipal wastes, *Arvada(CO).

Problems of grease digestion at the Arvada waste water treatment plant, Colorado, due to the destruction of bacterial action by industrial wastes were handled by a program of bacterial supplementation. Type A DBC Plus dried bacterial cultures were added along with wetting agents and buffers to plant influent after grit removal at rates of 14 pounds/day for 10 days, and afterwards additions were gradually decreased. Occasional industrial discharges of chromates have periodically halted the system, but the operations have been altered to recover these compounds. Since the new system has been in operation, effects of cold weather on BOD and suspended solids reduction have not been as severe, and odor has been reduced. Complete digestion of sludge has also helped to prevent some of the odor problems. After 9 months of operation, a line that used to clog continuously with grease due to restaurant wastes required no additional maintenance other than the supplemental bacterial treatment. The technique allows in-house management and regulation of environmental conditions affecting treatment processes. (Geiger-FRC)
W81-01638

URBAN AND AGRICULTURAL DEVELOPMENT: THE WASTE WATER ROLE,
B. Christopher.
Public Works, Vol 111, No 4, p 65-66, April, 1980.

Descriptors: *Water reuse, *Soil amendments, *Irrigation programs, Irrigation water, Imparied water use, Waste water treatment, *Reclaimed water, Colorado, Sludge disposal, Reservoirs, Water storage, Local governments, Federal government, Water resources development.

A water reuse program has been operating successfully in Westminster, Colorado, wherein secondary treatment plant effluents are used by farmers for irrigation water in exchange for their allotted amount of canal-supplied irrigation water which may have been reduced in periods of water shortages. The system, which has been in operation since 1977, utilizes the pumping of water from the treatment facility to the Farmer's High Line Canal two miles away. The city draws water from Standley Lake when it is needed without purchasing additional water rights. An expansion of the treatment plant scheduled to be completed in 1982 will provide the city with 3,000 acre feet of water annually. Pumping of potential irrigation water to the system will substantially reduce the costs that the city would have had to pay to purchase raw water. Local courts have addressed the parameters of the exchange system, and precedents will decide the ultimate potentials of the reuse program. A reservoir to store effluents generated in the winter is planned so that farmers may begin to use the supply for irrigation during spring planting in April and May. Liquid sludge has also been injected into cultivated farmland, eliminating all the sludge from the city's operation and avoiding the need for expensive landfilling. Higher yields of corn were reported from sludge amended plots, which were attributed to increased nutrients and mulching effects. Daily quality tests have been conducted by local farmers and city and state health officials. The cooperation of the city water treatment facilities with local farmers has received praise from all sectors of government. (Geiger-FRC)
W81-01640

AUSTIN'S INTERCEPTOR AND TREATMENT PLANT: ENGINEERING WONDER,
Water and Waste Water Dept., Austin, TX.
For primary bibliographic entry see Field 8A.
W81-01641

CONTROLLING AMMONIA IN WASTE WATER EFFLUENTS,
Environmental Protection Agency, Chicago, IL.
D. H. Stoltenberg.
Public Works, Vol 111, No 2, p 72-73, February, 1980. 2 Fig, 2 Tab, 3 Ref.

Descriptors: *Ammonia, *Nitrification, *Activated sludge, Aeration, Biological treatment, Nitrate, Nitrite, Temperature, Hydrogen ion concentration, Dissolved oxygen, Biochemical oxygen demand, Organic compounds, Metals, Flocculation, Aerobic bacteria.

Ammonia nitrogen is undesirable in waste water treatment plant effluents due to its toxicity to fish, its high oxygen demand and its ability to combine with chlorine to form chloramines. The activated sludge process can biologically convert ammonia to nitrite and nitrate by nitrification. Favorable temperatures for nitrifying bacteria are in the range of 5-30 degrees, with more efficient processing occurring in the summer than in the winter. Dissolved oxygen conditions in aeration tanks should be maintained at 2.0 mg/liter or above, and the optimum pH for nitrification is 8.4 and should not fall below 7.0. To require nitrification, the ammonia nitrogen concentration of an influent waste water should be more than 1 mg/liter at all times. Toxic metals and organics may also interfere with the nitrification process. Conventional activated sludge processes are usually well suited to biological nitrification. Contact stabilization is generally not adequate for nitrification, because insufficient biological mass in the contact tank often produces incomplete removal of ammonia by the floc. (Geiger-FRC)
W81-01644

OPERATIONAL EXPERIENCE WITH AERATED LAGOONS,
Hawksley (Watson) Consulting Engineers, High Wycombe (England).
H. R. Oakley.
Progress in Water Technology, Vol 11, No 3, p 239-242, 1980. 2 Fig, 2 Tab.

Descriptors: *Aerated lagoons, *Sewage lagoons, *Operatings, Costs, On-site investigations, Performance, Baffles, Settling basins, Aeration, *Sewage treatment.

Operating experiences with two aerated lagoons with integral settlement zones are described. One, in the Middle East, treats settled sewage to a nitrified standard suitable for limited reuse applications. The second, in the Far East, treats crude sewage to a standard suitable for sea discharge. Initially some difficulties were experienced in obtaining adequate settlement in the settling zones, but this was corrected through modifications to the baffle. This form of treatment has low capital costs but high power consumption and high operating costs. Thus, these lagoons are most successful when used for short-term temporary works and should be of the simplest construction possible. The main process design parameters are presented. The initial operating results of the Middle Eastern lagoon included: effluent BOD 16 of mg/liter, effluent suspended solids of 21 mg/liter, and effluent NH3N of 1 mg/liter. (Small-FRC)
W81-01645

CONVENTIONAL BIOLOGICAL FILTERS AT ULTRA-HIGH LOADINGS AS MAIN PROCESS STAGE FOR A STRONG MIXED WASTE,
Ninham Shand, Inc., Cape Town (South Africa).
H. C. Blersch.
Progress in Water Technology, Vol 12, No 3, p 243-249, 1980. 3 Fig.

Descriptors: *Filtration, *Rocks, Biochemical oxygen demand, Filters, *Canneries, *Waste water treatment, Industrial wastes, Sedimentation, Aeration.

Very highly loaded two-stage stone media biological filters are part of a 35,000 cu m/day treatment plant treating waste which originates largely from fruit canneries. The biological filters have a diameter of 30.5 m and a depth of 2.7 m, and use rounded river pebbles as the filtering media. The waste piped from the industrial sites has a BOD of 1,200 to 1,400 mg/liter. Little increase in BOD removal is obtained at loadings exceeding 4 kg/cu m/day in these coarse media filters, but the filters will tolerate loadings exceeding 6.0 and will produce an effluent acceptable to fine media filters at such high loadings. The optimum ratio of primary to secondary filter volumes was approximately 1.0 : 1.1 for maximum combined removal capacity. With two-stage filters in this ratio, BOD removal will be 1.6 kg/cu m/day at loadings per cu m of combined media volume of 2.2 kg/day (70% removal). After evaluations of full scale performance data, the following treatment sequence was adopted: (1) Primary sedimentation, (2) Two-stage biological filtration, (3) A mechanically aerated lagoon with 10 days retention during peak flow, and (4) Existing treatment ponds. (Small-FRC)
W81-01646

THE WULKATAL TREATMENT PLANT - COMBINED TREATMENT OF FOOD PROCESSING WASTES BY A LOWLY LOADED ACTIVATED SLUDGE PROCESS,

Amt der Burgenlandischen Landesregierung, Eisenstadt (Austria).
W. Stalzer.
Progress in Water Technology, Vol 12, No 3, p 251-261, 1980. 4 Fig, 6 Tab, 8 Ref.

Descriptors: *Waste water treatment, *Aeration, *Chemical precipitation, *Activated sludge, Treatment facilities, Municipal wastes, Industrial wastes, *Food processing industry, Canneries, Costs, Energy, Austria.

Extended aeration with simultaneous precipitation (Fe+ +) was used to treat municipal sewage, effluent from a canning operation, and effluent from a sugar beet processing plant. Variation in load ranged from 300 kg BOD5/day to 9000 kg BOD5/day. Excellent effluent concentrations were obtained: 8.6 mg/liter BOD5, 19.5 mg/liter COD, 6.9 mg/liter total coliforms, 0.7 mg/liter NH4-N, 15.2 mg.liter NO3-N, and 1.4 mg/liter PO4-P. Despite no controlled denitrification and full nitrification, 45% total-N was removed as well as 90% total P. Sixty to 70% of influent COD load contributed to respiration, and 25 to 35% was incorporated into excess sludge. Specific energy consumption for the plant was 1.6 kWh/kg BOD5. The plant required a small staff and produced a small amount of excess sludge. Disadvantages included the high energy requirements and higher construction cost compared to more highly loaded plants. (Small-FRC)
W81-01647

5E. Ultimate Disposal Of Wastes

INSTALLATION FOR TREATMENT OF SEDIMENTS COMING FROM STATIONS FOR PURIFICATION OF INDUSTRIAL WASTE WATER,
Regie Nationale des Usines Renault, Boulogne-Billancourt (France). (Assignee).
M. Petiot.
U. S. Patent No 4,198,914, 4 p, 1 Fig, 7 Ref; Official Gazette of the United States Patent Office, Vol 993, No 4 p, 1194, April 22, 1980.

Descriptors: *Patents, *Waste water treatment, *Sediments, *Industrial wastes, Sludge, Sludge disposal, Incineration, Industrial plants.

An installation for the treatment of sediment coming from a purification station for industrial waste water consists of a static furnace incinerator into which sediment is transferred by means of an injector. The injector is made up of an elbow tube connected between the furnace and the sediment, a blast pipe injecting air into the furnace and drawing sediment with it due to the vacuum created by the blasted air flow, and an additional air inlet in the furnace wall, the additional air inlet surrounding the elbow. The combustion of this detritus proves to be a satisfactory solution, since the treatment of 4 sq m of the latter leads to only about 10 kg of residual ash. However, in putting such a process into operation there is a problem of transshipment of heterogeneous residues between the storage tank and the incinerator. The invention remedies those drawbacks, notably in eliminating the operations of mechanical pumping and filtration, difficult and complex. (Sinha-OEIS)
W81-01452

CHARACTERISTICS OF FULL AND PARTIAL MULTIPORT DIFFUSERS DISCHARGING THERMAL WASTES IN OPEN CHANNEL FLOW,
Florida Univ., Gainesville. Dept. of Civil Engineering.
B. A. Christensen, J. G. Melville, and A. D. Parr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-161085, Price codes: A08 in paper copy, A01 in microfiche. Florida Water Resources Research Center, University of Florida Publication No 49, December, 1980. 156 p, 52 Fig, 3 Tab, 36 Ref, 3 Append. OWRT-A-035-FLA(1), 14-34-0001-7019, 14-34-0001-7020.

Descriptors: *Heat transfer, *Diffusion, *Jets, *Open channel flow, *Thermal pollution, Discharge(Water), Pipe flow, Streamflow, Thermal water, Energy dissipation, Energy transfer, Hydraulics, Channel flow, Continuous flow, Heat flow, Temperature, Evaluation, Mechanical engineering, Equipment, Cooling towers, Waste water(Pollution).

Of the two system types which transfer condenser waste heat to the atmosphere, once-through cooling systems are significantly less costly than closed-cycle cooling systems. For once-through cooling, disposal methods using multiport diffuser-pipes provide the most efficient mixing by discharging the heated water effluent through high velocity jets near the bed of the receiving body of water. In addition, specific State of Florida regulations exist for heated effluent disposal in the Florida Administrative Code. The present work concerns itself with an undistorted physical model of a multiport diffuser-pipe, discharging heated water into a co-flowing ambient. Vertical jet angle and transverse discharge distribution were varied and the resulting mixing characteristics were noted. Best mixing for large distances downstream of the diffuser occurred with a jet angle of ten degrees, but major drawbacks existed. The most promising angle was 20 degrees. In port spacing, no jet interference was observed in the plan isotherms for any of the runs. Finally, it was observed that, for the same quantity of heat to be injected into the ambient, partial diffusers perform much less efficiently than full. The optimal design is to match the diffuser discharge distribution to that of the ambient. (Zielinski-IPA)
W81-01473

EFFECT OF SEWAGE EFFLUENT ON MICROBIAL ACTIVITIES AND COLIFORM POPULATIONS OF PAHOKEE MUCK,
Florida Univ., Belle Glade.
For primary bibliographic entry see Field 5B.
W81-01529

SOIL POTENTIAL RATINGS FOR SEPTIC TANK ABSORPTION FIELDS IN LEON COUNTY, FLORIDA,
Soil Conservation Service, Lanham, MD.
For primary bibliographic entry see Field 5B.
W81-01537

CODISPOSAL OF MUNICIPAL SOLID WASTE AND SLUDGE.
Public Works, Vol 111, No 2, p 88-89, 98, February, 1980. 3 Fig, 1 Tab, 1 Ref.

Descriptors: *Waste disposal, *Economics, *Sludge, *Municipal wastes, *Solid wastes, Incineration, Waste water treatment, Air pollution, Landfills, Leaching, Environmental effects, Boilers, Fuels, Energy conversion.

Simultaneous disposal of solid waste and waste water treatment sludges (codisposal) is proposed as a more efficient method of waste disposal and may be handled by landfilling, composting, or thermal destruction. Thermal destruction is useful for recovery of refuse derived fuel from multiple hearth or fluidized bed sludge incinerators, sludge in multiple solid waste (MSW) incinerators, sludge in MSW dedicated boilers, and sludge in MSW starved-air combustors. Of these, the MSW incinerator method proves the most economical. Comparisons of annual costs of the methods yielded estimated combined single purpose costs (in thousands of 1978 dollars) of 5,420 for the multiple hearth/fluidized-bed system, 6,395 for the waterwall method, 6,995 for dedicated boiler techniques, 1,077 for modular incineration and 8,495 for pyrolysis. EPA fundings for co-disposal options are also considered. The remaining questions concerning co-disposal technologies focus on environmental issues. Problems of air emissions and leachate from combustion residue matter landfills are the main ecological disadvantages of such systems. (Geiger-FRC)
W81-01634

5F. Water Treatment and Quality Alteration

PILOT STUDY OF FLUORIDE AND ARSENIC REMOVAL FROM POTABLE WATER,
Rubel and Hager, Inc., Tucson, AZ.
F. Rubel, Jr., and F. S. Williams.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-111080, Price codes: A03 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/2-80-100, August, 1980. 43 p, 5 Fig, 6 Tab, 8 Ref, 3 Append. 68-03-1351.

Descriptors: *Potable water, *Water purification, *Arsenic, *Fluorides, Adsorption, Water treatment, Pilot plants, Treatment facilities, Costs, Arizona, Activated alumina.

Fluoride and arsenic are two contaminants frequently found in high concentrations in drinking water. Occasionally, the two contaminants are found together in the same water supply, which presents a unique treatment problem. Pilot plant studies were conducted on the removal of fluoride and arsenic from potable water using activated alumina as the adsorbent. The tests were conducted using water from the community of Why, Arizona, that contained 3 mg/l fluoride and 0.15 mg/l arsenic. Activated alumina is shown to be effective means of treating this water. Arsenic is preferentially adsorbed on the activated alumina, and a stronger sodium hydroxide solution (4%) is required during regeneration of the activated alumina for arsenic than for fluoride (1%). The capacity of the alumina for removing fluoride is decreased by any arsenic remaining in the alumina. The pilot studies indicate that the preferred method of treating water with these combined contamiants is the use of two activated alumina columns in series. A schematic of a full-sized treatment plant is included, along with engineering estimates of operating and capital equipment costs for small communities. Operating costs are approximately 5 cents per kiloliter of treated water (19 cents per 1000 gallons). (Moore-SRC)
W81-01437

PACKAGE WATER TREATMENT PLANTS, VOLUME 1. A PERFORMANCE EVALUATION,
Cincinnati Univ., OH. Dept. of Civil and Environmental Engineering.
J. M. Morand, C. R. Cobb, R. M. Clark, and R. G. Stevie.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-110934, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/2-80-008a, July, 1980. 54 p, 10 Fig, 13 Tab, 8 Ref, 2 Append. GS-05S-10458.

Descriptors: *Water treatment, *Treatment facilities, *Potable water, *Rural areas, Kentucky, West Virginia, Tennessee, Costs, Turbidity, Water quality, Water purification, Operation and maintenance.

Many small and rural water systems have both cost and quality problems. Their unit costs tend to be higher because of the small number of connections they service. Package water treatment plants are a possible alternative to conventional water treatment. These plants are self contained units that can be installed for minimum cost. Results from a study of 36 package plants in Kentucky, West Virginia and Tennessee show that these treatment plants can provide water that meets the turbidity limits established under the National Interim Primary Drinking Water Standards. Plants that were not meeting standards had problems caused by lack of operator attention, such as not varying chemical dosage to meet changing raw water quality, or they were not running for lengths of time sufficient to achieve stable operation. These plants, contrary to some manufacturers' claims, are not totally automatic but require supervision. Nevertheless when properly maintained and operated, they can provide good quality drinking water at minimum cost. (Moore-SRC)

W81-01440

SPLIT FLOW WATER TREATMENT PLANT,
Neptune Microfloc, Inc., Corvallis, OR. (Assignee).
A. K. Hsiung, and G. F. Eaton.
U. S. Patent No 4,199,451, 5 p, 4 Fig, 7 Ref; Official Gazette of the United States Patent Office, Vol 993, No 4, p 1372, April 22, 1980.

Descriptors: *Patents, *Water treatment, *Waste water treatment, Water purification, Flow control, Settling basins, Flocculation, Filtration, Water levels, Equipment.

It is an object of this invention to provide a packaged water treatment plant that will permit more cost-effective design configurations, provide treated water in larger capacities, and which will be applicable to both water and waste water treatment. The split flow water treatment plant includes a settling basin comprising a pair of banks of generally horizontally extending settling tubes and an inlet baffle comprising parallel vertical perforated sheets upstream of and adjacent to each of the banks. An inclined diverting plate extends from the downstream end of the lowermost tube in the first of the banks to the upper upstream end of the inlet baffle adjacent the second bank. The distribution of flow between the banks may be regulated by an adjustable weir or by water level control. (Sinha-OEIS)
W81-01445

FILTER APPARATUS USING FLOATING FILTER MEDIUM,
Ishigaki Kiko Co. Ltd., Tokyo (Japan). (Assignee).
A. Iwatani.
U. S. Patent No 4,198,301, 9 p, 4 Fig, 7 Ref; Official Gazette of the United States Patent Office, Vol 993, No 3, p 986-987, April 15, 1980.

Descriptors: *Patents, *Water treatment, *Water quality control, Filtration, Separation techniques, *Filters, Equipment, Backwashing, Floating filter medium.

A filter apparatus contains a filter tank separated by a water-penetrable partition wall into an upper section forming a filtrate reservoir and a lower section forming a filter chamber. Floating filter medium is place in the filter chamber. Water to be filtered is fed into the filter chamber at the bottom and caused to flow upward, passing through the floating filter medium. The filtrate is removed from the reservoir. The apparatus is further characterized by the improvements including: apparatus for agitating the filter medium, a pit beneath the filter chamber, a siphon-shaped discharge pipe for back-flow wash water with a discharge opening positioned adjacent the bottom of the pit, the discharge pipe being provided with a siphon breaker having an air feed port positioned adjacent the bottom of the filter chamber, a supply pipe for feeding water to be filtered into the filter chamber with a feed opening positioned adjacent the bottom of the filter chamber so as not to disturb water retained in the pit. (Sinha-OEIS)
W81-01453

PROCESS AND APPARATUS FOR TREATING DRINKING WATER,
Consolidated Foods Corp., Old Greenwich, CT. (Assignee).
J. J. Doumas, A. H. Molof, G. H. Raymond, and L. Wikstrom.
U.S. Patent No 4,198,296, 14 p, 11 Fig, 7 Ref; Official Gazette of the United States Patent Office, Vol 993, No 3, p 984, April 15, 1980.

Descriptors: *Patents, *Water treatment, *Water quality control, *Water purification, Suspended solids, Halides, Activated carbon, Oxidation, Disinfection, *Silver ions.

A process and apparatus for producing biologically safe and palatable drinking water is described in which water may be preconditioned by removal of suspended solids and further subjected to removal of halide ions and then subjected to treatment with a disinfectant or combination of disinfectants capable of exercising suitable biocidal and virucidal action. This may be followed by steps and the utilization of apparatus to reduce below the legal limit for potable water the disinfectant. The disinfectant may be supplied by a compound capable of releasing silver ions by contacting the water with a media of activated charcoal having absorbed silver salts. Oxidizing disinfectants may be applied as solutions or soluble solids either alone or in sequence with silver ions. Objectionable amounts of the disinfectant may be reduced to the amount below the legal limit for potable water by passing the treated water through an activated charcoal media which is sanitized against bacterial growth or through ion exchange resins similarly sanitized or through a combination of both. The invention involves use of silver ions in the absence of chloride as a purifying agent. The use as purifying agents of other metallic ions, such as mercury ions or oxidizing disinfectants is also facilitated by the prior elimination of halide ions. (Sinha-OEIS)
W81-01458

WATER QUALITY EFFECTS RELATED TO BLENDING WATERS IN DISTRIBUTION SYSTEMS,
Southern California Metropolitan Water District, Los Angeles.
W. K. Schimpff, and H. E. Pearson.
Environmental Protection Agency Report EPA-600/2-80-132, August, 1980. 106 p, 25 Fig, 15 Tab, 15 Ref, 1 Append. R804709.

Descriptors: *Water distribution(Applied), *Water quality, *Imported water, *Corrosion, *Water chemistry, California, Diurnal, Corrosion control, Groundwater, Hardness(Water), Water properties, Alkalinity, Hydrogen ion concentration, Calcium carbonate, Water supply, Zinc phosphate, *Water blending effects.

In an area with a regional supplemental water supply there is the chance that a given water distribution system may be exposed to two waters of different quality and origin, and to various blends of the two waters, which could have an adverse effect on the distribution system itself or on the quality of the water. The Environmental Protection Agency mobile water quality monitoring laboratory was deployed at 30 selected sites in southern California where imported waters from the Colorado River and California aqueducts are used as delivered or blended with local groundwaters. Eighteen computer controlled parametric systems on board the laboratory analyzed and recorded field data to assess water quality factors associated with corrosion and stability. The waters studied could be classified as having moderate to high hardness, alkalinity and total dissolved solids content. The data were analyzed for significant interrelationships relative to pH, calcium hardness, alkalinity, dissolved minerals, corrosion rates, calcium carbonate deposition test results, and calculated values for the Langelier saturation and Ryzner stability indices. For waters of similar chemical composition the calcium carbonate deposition test results were more indicative of the benefits to be derived from pH control or zinc phosphate films for mitigating corrosion than the polarization corrosion rates. In one case, the diurnal shifting from one water source to another resulted in higher corrosion rates during the period when the surface water was blended with the well water than when either water was delivered alone. On the basis of this study, the blending of imported surface waters and their mixing with local groundwaters in this regional water system has not generated serious water quality problems in the distribution systems of the area. (Moore-SRC)
W81-01484

DECLINING-RATE VERSUS CONSTANT-RATE FILTRATION,
Sao Paulo Univ. (Brazil). Dept. of Hydrology and Sanitation.
For primary bibliographic entry see Field 5D.
W81-01532

AN OVERVIEW OF EUROPEAN WATER TREATMENT PRACTICE,
Water Storage Corp., Rotterdam (Netherlands).
P. L. Knoppert, G. Oskam, and E. G. H. Vreedenburgh.
Journal of the American Water Works Association, Vol 72, No 11, Part 1, p 592-599, November, 1980. 9 Fig, 17 Tab.

Descriptors: *Water treatment, *Water pollution treatment, *Storage, *Europe, Water quality control, Water purification, Organic chemicals, Ammonia, Chlorination, Rivers, Ozone, Monitoring, Bioindicators, Coagulation, Rhine River, Activated carbon.

Although European river water quality has improved with respect to certain parameters, the micropollutant load is still a major problem. This paper discusses recent water technology developments in several European countries. Automatic monitoring continuously measures water quality in major rivers. Several countries use the behavior of live rainbow trout to warn of high pollution levels, especially an accidental release of toxic material. Emergency storage protects against accidental pollution situations and during periods of low flow. Storage also decreases the concentration of ammonia, heavy metals, bacteria, organic chemicals, and other contaminants. Chlorination of raw water before transport has been largely eliminated to reduce production of trihalomethanes. Biological nitrification is used to oxidize ammonia in place of breakpont chlorination. Some cities now use chlorine dioxide or ozone in place of chlorine. Reducing precursor levels is accomplished by using improved coagulants (alkaline polyaluminum chloride), optimized floc separation techniques, and granular or powdered activated carbon. (Cassar-FRC)
W81-01533

CANCER MORTALITY AND PUBLIC DRINKING WATER IN ST. LOUIS CITY AND COUNTY,
Missouri Univ.- Columbia.
C. J. Marienfeld, M. D. Collins, H. T. Wright, R. Reddy, and G. Shoop.
Journal of the American Water Works Association, Vol 72, No 11, Part 1, p 649-654, November, 1980. 5 Tab, 14 Ref.

Descriptors: *Potable water, *Mortality, Epidemiology, Public health, *Cancer, St. Louis, *Water pollution effects, Pathology, Human diseases.

Cancer death certificates for St. Louis City and County were classified according to residential areas served by the different water sources identified: the Missouri River, the Meramec River, and a deep well. The latter two sources were hypothesized to have lower carcinogen contents than the Missouri River water. However, the higher cancer death rate in the city of St. Louis as compared with the adjacent St. Louis County was concluded not to be a result of differences in the city and county water supplies for the period of study, 1960-1976. In fact, no significant differences in water quality are seen in the common source, the Missouri River, in the treatment processes, in Ames mutagenicity tests, nor in inorganic chemical analyses. The mortality rates appear to be inversely correlated with income and school years completed, and directly correlated with the percentage of incomes below the poverty level, percentage of unskilled workers, and air pollution as measured by suspended particulates and sulfur dioxide. (Cassar-FRC)
W81-01534

ELEVATED LEVELS OF SODIUM IN COMMUNITY DRINKING WATER,
Massachusetts Univ., Amherst.
E. J. Calabrese, R. W. Tuthill, J. M. Klar, and T. L. Sieger.
Journal of the American Water Works Association, Vol 72, No 11, Part 1, p 645-649, November, 1980. 2 Fig, 1 Tab, 21 Ref.

Descriptors: *Sodium compounds, *Potable water, *Blood pressure, Hypertension, Water pollution effects, *Massachusetts, Standards, Human diseases, Salinity, Water properties.

Students in two geographically contiguous Massachusetts towns with similar socio-economic conditions and differing sodium levels in the drinking water were subjects of a blood pressure study. Both third grade and tenth grade students in the community with higher sodium content (107 mg per liter) in the water supply had statistically significantly higher blood pressures than those children from the low sodium area (8 mg per liter). Systolic and diastolic readings differed by about 3-5 mm Hg between the two communities. Excretion studies on the third graders showed Na-K ratios of 5.4 (boys) and 5.1 (girls) for those drinking high sodium water and 3.7 for those in the low sodium area. (Cassar-FRC)
W81-01535

RESOURCE MANAGEMENT OF AN INDUSTRIAL RIVER SYSTEM,
Yorkshire Water Authority (England).
K. H. Tattersall.
Journal of the Institution of Water Engineers and Scientists, Vol 34, No 5, p 453-473, 1980. 4 Fig, 3 Tab.

Descriptors: *Management, *River systems, *Reviews, Riparian rights, Sewage treatment, Rivers, Water quality, Legal aspects, Water resources, Resource allocation, Geology, Topography, Flow rates, River basin development, Industrial wastes, Industrial water, *Yorkshire River System(UK), *England.

Management of an industrial river may call for its proper use as a drainage channel, a source of water power, or a hydro-cooling device. In Great Britain the Water Resources Act of 1963 and the Control of Pollution Act of 1974 are aids in water resource management in controlling the use of industrial rivers. The Yorkshire River system is examined as typical industrial river, and its management by the Yorkshire Water Authority is reviewed. The topography, geology, and tributaries of the system as well as the populations that they serve are outlined. Among the hydrologic considerations of an industrial river, the dry weather flow is an important management parameter. Flow diagrams are used to estimate flow information at various points along the river. River water quality models are usually calculated for each pollutant to aid in the management of the industrial river. The Water Resources Act set guidelines for compensation water to meet modern requirements. Other aspects of industrial rivers that are examined include water power, fish farming, irrigation, industrial and groundwater abstractions, mine drainage, sewage treatment, and trade effluents. The Water Authority is responsible for managing a river to satisfy the greatest number of interests and preserve riparian rights. (Geiger-FRC)
W81-01542

THE OCCURRENCE OF MICROORGANISMS IN WATER MAIN ENCRUSTATIONS,
Environmental Protection Agency, Dallas, TX. Air and Hazardous Materials Div.
For primary bibliographic entry see Field 5B.
W81-01545

BACTERIAL, CHEMICAL, AND MINERALOGICAL CHARACTERISTICS OF TUBERCLES IN DISTRIBUTION PIPELINES,
Ohio State Univ., Columbus. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W81-01546

UPGRADING THE OLD WHILE BUILDING THE NEW,
Inca, Ltda, Cali (Colombia).
L. E. Medina, and H. E. Hudson, Jr.
Journal of the American Water Works Association, Vol 72, No 12, p 666-671, December, 1980. 4 Fig, 5 Ref.

Descriptors: *Water treatment, *Construction, Water quality control, Construction costs, Costs, Planning, *Colombia, Water demand, Potable water, Deforestation, Turbidity, On-site investigations, Low flow, Flocculation.

The upgrading of an already existing water treatment plant during the construction of a new facility to meet increased consumer demand is reviewed. The Rio Cali plant was 50 yrs old. The renovation undertaken allowed its capacity to be increased and advantage taken of the low turbidity of the Rio Cali throughout most of the year. An additional advantage is that the plant serves the higher, older part of the city by gravity, thus reducing energy costs. The study included a determination of the hydraulic capacity of the system, a study of the processing capacity of existing structures, and the design of modifications to yield increased capacity. The maximum capacity of the raw water canal was determined to be set for 173 ML/day. The flocculation, sedimentation, and filtration systems are described. The modification was undertaken in a series of steps, since the service could not be interrupted. (Baker-FRC)
W81-01547

HYDRAULIC CONSIDERATIONS IN DECLINING-RATE FILTRATION,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 5D.
W81-01550

NEW DAY DAWNS FOR CALIFORNIA WATER,
T. S. Maddock, and D. L. Hardan.
Water and Wastes Engineering, Vol 17, No 10, p 39-42, October, 1980. 1 Fig, 3 Tab.

Descriptors: Networks, *Treatment facilities, *Municipal water, Industrial water, *California, Flocculation, Filtration, Chlorination, Chemicals, *Irrigation water, Agriculture, Telemetry, *Domestic water, Quartz Hill treatment plant(CA).

The Quartz Hill water treatment plant, which will provide full treatment for 14 mgd of raw water and will eventually expand to treat 56 mgd, is described as the major facility in the DAWN (Domestic and Agricultural Water Network) water distribution system. DAWN will distribute 140,000 acre-feet of water annually for municipal and industrial use through a 150 mile distribution network. The Quartz Hill water treatment plant is the administrative headquarters of DAWN and houses the project management and operational facilities, including the central computer. Influent first passes through a moss screen, then water is treated as needed with chemicals: chlorine, alum, polyelectrolytes, caustic soda, and activated carbon. Following mixing with chemicals, flocculation is performed. Water is clarified and passed through four dual media filters. After chlorination, the water is released to the distribution system. Sludge is dewatered and transported to a Class 2 disposal area. (Small-FRC)
W81-01576

NEW YORK CITY'S PILOT PLANT FILTER STUDIES,
Metcalf and Eddy, Inc., New York.
G. P. Fulton.
Public Works, Vol 111, No 4, p 62-64, April, 1980. 3 Fig.

Descriptors: *Pre-treatment, *Pilot plants, *Filters, *Water treatment, Model studies, Turbidity, Color, Organoleptic properties, Water quality, Filtration, Sludge, Flocculation, Porous media, Costs, *New York City.

The high costs of water treatment, resulting in part from the stringent regulations of the Federal Safe Drinking Water Act, have led to a number of pilot plant studies aimed at upgrading the water quality of the Croton System, a 375 square mile major watershed of the New York City area. In the spring of 1971, the Croton supply was plagued with unsatisfactory organoleptic features attributed to an increased nutrient load from excessive urban development, and consequently better water treatment methods were sought. Various piping arrangements in pilot plant studies allowed the use of all, some, or none of four pretreatment chambers which offered flocculation, settling or filtration. Filtration options involved the use of dual anthracite/sand media or Neptune Microfloc multimedia. The flow rate through each pretreatment pattern was kept at 10 gpm, and turbidity was continuously recorded from inlet raw water, filter manifold water, and filter effluents. Piezometric measurements were made manually by manometer for each filter. After 14 months of testing, no distinct prototype simulations were obtained from the settling experiments due to unpredictable sludge depths. The granular filter performed well in the pilot simulation, but care must be taken during filter washings to eliminate trapped air surges. The release of dissolved air near filter heads due to changes in water temperature must also be carefully monitored by the operator. It was also noted that full-sized filter units cannot be effectively simulated in pilot column installations, and care must be taken in selecting a single spray nozzle with a proper discharge pattern. Some energy and costs considerations for the pilot pretreatment systems are also given. (Geiger-FRC)
W81-01642

ECONOMICAL ZERO DISCHARGE ACHIEVED AT WATER PLANT,
Wauford (J. R.) and Co., Nashville, TN.
R. C. Woods.
Public Works, Vol 112, No 1, p 65, January, 1981.

Descriptors: *Water treatment, *Treatment facilities, *Settling basins, *Water purification, Potable water, Sludge disposal, Lime, Chemicals, Project post-evaluation, Tennessee, Costs, Lewisburg(TN).

The city of Lewisburg, Tennessee, acting as its own general contractor, built a 4 mgd water treatment plant with no waste water discharge for $172,000. The treatment facility consists of a large reinforced settling tank with a total water volume of 250,000 gal. This tank functions as a gravity thickener, with dual rectangular hoppers for sludge withdrawal and a telescoping valve for decanting supernatant. The thickened sludge is dewatered on open-air sand drying beds, and final disposal is on city owned property by trench burial. Treatment chemicals are alum, lime, and occasionally potassium permanganate and activated carbon. Thus the sludge is basically an alum-lime sludge. The supernatant is recycled, making zero discharge of waste water possible. Thus, no waste water is discharged back into the Duck River. Through proper management, the city was able to build a very successful plant itself. (Small-FRC)
W81-01643

5G. Water Quality Control

INVESTIGATION INTO EFFLUENT DISCHARGES FROM WASHINGTON FRESH APPLE PACKERS, VOLUMES I AND II,
SCS Engineers, Long Beach, CA.
For primary bibliographic entry see Field 5B.
W81-01431

COALESCENCE OF OIL IN OIL/WATER EMULSIONS,
Imperial Chemical Industries Ltd., London (England). (Assignee).
D. B. Chambers, and B. Walker.
U. S. Patent No 4,199,447, 4 p, 6 Ref; Official Gazette of the United States Patent Office, Vol 993, No 4, p 1371, April 22, 1980.

Descriptors: *Patents, *Water quality control, *Oil pollution, *Water pollution treatment, Emulsions, Coalescence, Plastics, Separation techniques, Oleophilic properties.

This invention related to a method for the removal of oil from an oil in water emulsion by passing the emulsion through a fibrous structure comprising fibres having finely divided particles having an average size of one micron or less and which exhibit oleophilic and hydrophobic properties adhered to and penetrating their outer surfaces, and removing the coalesced oil droplets so formed. A particularly desirable expanded plastics material for this purpose is a hydrophilic plastics material

such as a hydrophilic polyurethane foam. (Sinha-OEIS)
W81-01446

OIL/WATER SEPARATION PROCESS AND APPARATUS,
Imperial Chemical Industries Ltd., London (England). (Assignee).
G. F. G. Clough.
U.S. Patent No 4,199,446, 6 p, 2 Fig, 8 Ref; Official Gazette of the United States Patent Office, Vol 993, No 4, p 1371, April 22, 1980.

Descriptors: *Patents, *Water quality control, *Water pollution treatment, *Oil pollution, Emulsions, Coalescence, Equipment, Flow control, Separation techniques, Gravity separation.

Oil is removed from an oil in water emulsion by a process in which the emulsion is passed through a coalescer which coalesces the oil droplets within the emulsion so that they can be removed by gravity separation. The emulsion is passed into and through a vessel containing a rectangular shaped oil coalescer which is immersed in the emulsion so that the emulsion flows through the coalescer from a first face to a second face. During operations suspended solids are retained on the upstream face of the coalescer and the passageways through the coalescer are progressively obstructed by the solids. Changing the position of the coalescer within the vessel and reversing the direction which the emulsion flows through the coalescer allows the emulsion to flow through the coalescer from its second face to the first face. The temporary reversal of flow through the coalescer causes a substantial proportion of the retained solids to be dislodged and removed in the stream. (Sinha-OEIS)
W81-01447

WATER QUALITY MANAGEMENT-HAVE WE LOST SIGHT OF THE OBJECTIVE,
Mathematical Sciences Northwest, Inc., Bellevue, WA. Consulting Div.
For primary bibliographic entry see Field 6E.
W81-01510

AN OVERVIEW OF EUROPEAN WATER TREATMENT PRACTICE,
Water Storage Corp., Rotterdam (Netherlands).
For primary bibliographic entry see Field 5F.
W81-01533

STATISTICS FOR GROUNDWATER QUALITY ASSESSMENT,
Calscience Research, Inc., Huntington Beach, CA.
R. D. Morrison, and R. J. Stearns.
Public Works, Vol 111, No 2, p 90, 100, February, 1980. 2 Tab.

Descriptors: *Statistical models, Water quality, *Water quality control, Monitoring, *Groundwater, Leaching, Landfills, Waste disposal, Wells, Probability, Water pollution sources, Mathematical studies, Equations.

As groundwater quality monitoring programs expand, the maintenance of an overall perspective becomes more difficult. Often officials must rely on data obtained from the sampling of well networks to monitor the quality of an underground water supply. This system is useful in checking for contaminating leachates from waste disposal sites when complete physiographic baseline data is available. Statistical models are described to aid in reducing judgmental errors in monitoring practices. Sampling wells must be categorized in terms of their relationship to the contamination source. The categorization system distinguishes a background well, an onsite well, a downstream well, and an underlying well. The parametric r, Student's t test, and the Mann-Whitney U test provide a wide range of statistical accuracy. An equation is given to generate probability values (P). Low P values (less than .05) are suggestive of a relationship between two well groups, while P values greater than .05 indicate a lower probability of a relationship between well groups. The system provides useful data about the relationship of a disposal site to observed groundwater quality degradation. (Geiger-FRC)
W81-01635

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

AN EVALUATION OF MICHIGAN'S WETLAND PROTECTION ACT AND RECOMMENDATIONS FOR ITS IMPLEMENTATION,
Great Lakes Basin Commission, Ann Arbor, MI.
R. A. Sullivan, and C. Wyman.
Great Lakes Environmental Planning Study (GLEPS), Contribution No 27. August, 1980. 171 p, 16 Fig, 3 Tab, 3 Append.

Descriptors: *Michigan, *Wetlands, *Coastal marshes, *Water values, *Management, Flood protection, Aquatic habitats, Wildlife habitats, Groundwater recharge, Project planning, Project benefits, Bogs, Swamps, Marshes.

The Goemaere-Anderson Wetland Protection Act of 1980 is the result of a long-term effort to provide Michigan's wetlands with comprehensive and meaningful protection. The key provisions of the act are presented and analyzed. To make the act most effective, it is necessary to identify the major questions and problems most likely to arise in implementing it. A number of issues should be addressed by the Department of Natural Resources (DNR), including delineation of regulated wetlands, further clarification of certain Section 9 standards for permit review, determining an effective date for 'grandfathered' status to be assigned to a project, administration of a general permitting system, and means to deal with upland uses directly impacting wetlands. The DNR should initiate an active information/education effort to familiarize the public with the requirements and benefits of the act; in the process, DNR may learn of some non-regulated wetlands. Monitoring and enforcement should be a key part of the protection program. Procedures should be developed to define wetlands and to evaluate and estimate project impacts. A continuous evaluation of the program from its inception should be instituted; such an evaluation could save money and increase wetlands protection. Michigan's fiscal troubles underscore the necessity of carefully evaluating different program elements for their contribution to the ultimate program goals. (Atkins-Omniplan)
W81-01435

FLOOD CONTROL OPERATIONS AND OPTIMIZATION: A CASE STUDY FOR BONNY RESERVOIR, COLORADO,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
J. Kimzey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-163586, Price codes: A09 in paper copy, A01 in microfiche. MS Thesis, Summer, 1980. 179 p, 76 Fig, 20 Tab, 36 Ref, 7 Append. OWRT-B-195-COLO(2).

Descriptors: Reservoirs, *Flood control, *Flood routing, Operation optimization, *Optimization, Simulation analysis, Storm runoff, Hydrographs, Forecasting, Bonny Reservoir, South Fork Republican River(CO), Colorado.

Flood control operations for reservoirs are evaluated by discussing existing policies and optimization and simulation techniques. A case study for Bonny Reservoir, Colorado, routes five generated storm hydrographs through the reservoir considering the influence of the downstream reservoir. The storms are routed by a computer algorithm which simulates the standard operating rule and by a dynamic programming optimization algorithm. The resulting releases were lower for the more extreme storm events and higher for the less extreme storm events with the dynamic programming algorithm than the simulated standard operating rule.
W81-01494

PLANNING GROUNDWATER SUPPLY SYSTEMS FOR URBAN GROWTH: A MULTILEVEL PERSPECTIVE,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
J. W. Delleur, S. A. Dendrou, and G. V. Loganathan.
In: Water and Related Land Resource Systems. International Federation of Automatic Control Symposium, Cleveland, Ohio, 28-31 May, 1980, p 239-249, 1980. 6 Fig, 7 Tab, 17 Ref. Pergamon Press, New York. OWRT A-057-IND(2) and B-083-IND(12).

Descriptors: *Groundwater, *Urban water supply, Finite elements, Large scale systems, Mixed integer programming, Optimization, Urban systems, Water resources, Planning, Water supply, Urbanization, *Groundwater supply, *Model studies, Costs, Indiana, West Lafayette(IN).

A methodology has been developed to include effectively water supply from groundwater in urban planning. The model LANDUSE for prediction of urban development and water demand is linked to the model WATSUP, an optimization oriented finite element based water supply model for prediction and optimization of future water supply configurations. The nonlinearity of the objective function due to nonlinear head losses has been circumvented by means of empirical relationships for head losses and design criteria for pump and pipe sizes. The requirement that some decision variables such as the number of wells, equalizing reservoirs, etc. be integer variables leads to a mixed integer programming formulation. A two level coordination scheme is used in locating an optimal number of facilities such that cost is minimized and a safe exploitation of aquifer in the future is guaranteed. The methodology is applied to an actual situation in West Lafayette, Indiana.
W81-01498

PRACTICAL ASPECTS OF TOWN WATER PLANNING,
P. G. Fischer, Jr., and T. T. Chiang.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol 106, No WR1, p 159-172, March, 1980. 7 Fig.

Descriptors: *Planning, *Computer models, *Water demand, Model studies, Mathematical models, Runoff, Water requirements, River basin development, Watersheds, *Water supply, Precipitation, Rainfall disposition, Costs, Diversion, Water management, Probability, Ipswich River Basin, *Municipal water.

A case study was made of the practical aspects of town water-supply planning to demonstrate the importance of probability distributions of estimated demands and rainfall and to explain the use of digital computer modeling as a method for analyzing these probability distributions. The involvement of the 'systems' aspects along the reach of the river, including legal constraints, was also demonstrated. The Ipswich River Basin served as the study site, and the precipitation, population, projections, and water demand projections of this area are outlined. A 'safe yield' and a drought yield approach are examined for precipitation design purposes. Results have shown that the Nicholas Brook area would provide a divertable flow when combined with the existing impoundment storage, while the new 1.3 billion gallon Emerson Pond Reservoir would add 9.0 mgd. Raising the pool elevation of Swan and Middletown Ponds would create a 'safe yield' of 10.0 mgd. A data base for runoff data gave a detailed analysis of projected quantities and diversion rates, while knowledge of the precipitation probability allowed power costs to be developed. Energy and equipment costs and legal and topographical constraints are also examined. (Geiger-FRC)
W81-01511

COMMENT ON 'STOCHASTIC OPTIMIZATION OF WATER SUPPLY EXPANSION' BY M.G.V. BOGLE AND M. J. O'SULLIVAN,
Army Engineer Waterways Experimental Station,

Vicksburg, MS.
T. M. Walski.
Water Resources Research, Vol 16, No 6, p 1138, December, 1980.

Descriptors: *Estimated costs, *Water supply, *Construction costs, Planning, Water distribution(Applied), Public utilities, Cost analysis, Economics, Diseconomies of scale, Unit costs, Project planning.

The author suggests that the Bogle and O'Sullivan method (1979) for scheduling water supply plant expansion may have no practical application. Basically, the method describes construction of a water plant with annual incremental capital expenditures rather than expansions in 10 to 30 year increments. O'Sullivan and Bogle answer that their method applied to a particular type of plant capacity expansion problem which occurs in some water supply systems. The work was motivated by a proposed plant for Auckland, New Zealand. (Cassar-FRC)
W81-01513

A MODEL FOR LAND USE AND WATER QUALITY,
Washington Univ., Seattle. Graduate School of Public Affairs.
L. D. Goodisman, and F. Caslich.
Water Supply and Management, Vol 4, No 5/6, p 371-377, 1980. 6 Fig, 6 Ref.

Descriptors: *Water quality, *Land use, *Model studies, Planning, Washington, River basins, Water pollution sources, Municipal wastes.

A model for the relationship between land use and water quality was developed and tested to provide data on pollution from non-point sources. This information may be used for planning purposes and to set priorities for pollution abatement. It specifies a chain of relationships between land ownership (forest or park service, Indian, state, private) and hydromodifications (reservoir, channel, agriculturaI), between water parameters and water quality, between water quality and land use (agriculture, urban, range, forest), and between hydromodifications and river basin properties. As applied to river basins of the State of Washington, the model predicted 88% of the variation in biological water quality and 96% of the variation in recreational water quality. (Cassar-FRC)
W81-01571

CO-ORDINATION OF MODELS IN SOFTWARE SYSTEMS FOR LARGE SCALE WATER RESOURCES PROJECTS,
Soyuzgiprovodkhoz, Moscow (USSR).
A. S. Berezner, and F. I. Ereshko.
Water Supply and Management, Vol 4, No 4, p 253-262, 1980. 9 Ref.

Descriptors: *Mathematical models, *Water resources development, Model studies, Data processing, Stochastic processes, Computer models, Agriculture, Hydroelectric power, Water resources, Simulation analysis, Water supply development, Watershed management, River basin development, Water utilization, Recreation facilities, Design criteria.

Procedures are suggested for carrying out experiments on simulation systems for developing river basins using optimization and game-theoretic models. The system combines research from mathematicians, design engineers, agronomists, ichthyologists and other specialists under a process of computerized information management. Emphasis is placed on the development of scenarios to define control and stochastic parameters within the system of models. The generation of a water supply system scenario is described in detail. The simulation system for examining river basins used the following block models: water resources, agriculture, hydro-electric power, development of industry and of communal services, fishing, river transportation, and the sea. The interrelations of the water resources block, the agricultural block and the hydro-electric block are explained mathematically. The roles of sub-blocks of the agricultural block (the animal husbandry and plant sub-blocks) in the model are also explored. (Geiger-FRC)
W81-01573

6B. Evaluation Process

RESEARCH NEEDS IN MODELING AND DATA INTERACTIONS AS RELATED TO GOVERNMENT WATER RESOURCES PROGRAMS,
D. R. Dawdy, and T. Maddock, III.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-161002, Price codes: A04 in paper copy, A01 in microfiche. Completion Report to Office of Water Research and Technology, October, 1980. 50 p, 1 Tab, 28 Ref. OWRT-C-90293-T(No 9629)(1), 14-34-0001-9629.

Descriptors: *Research priorities, *Model studies, *Data collections, *Water resources, *Federal project policy, Federal government, Institutions, Management, Research and development, Evaluation, Planning, Project planning, Testing, Design, Experimental models, Mathematical models, Estimating, Hydrologic data, Theoretical analysis, Governmental interactions, Networks.

Four research areas were examined as they relate to three topics, groundwater, surface water, and, to a minor extent, water quality; since the problems and models for each of the three topics raise different questions. The research areas examined were: (1) assessment of problems facing water resources managers; (2) describing how models fit into programs developed to solve water resources problems; (3) assessing how well models fit program objectives; and (4) assessing data requirements for the models in terms of the way data requirements, models, and programs interact. About 40 questions were developed and categorized in the assessment of models, data needs, and government programs that use these models and data, to identify research needs. It was also generally concluded that: a central clearinghouse is needed concerning model use to judge the use and appropriateness of models; research should be undertaken into attitudes toward modeling; the worth of existing data and situations of no data should be evaluated as related to modeling; and that model uncertainty analysis should be applied more widely and consider economic impacts for model requirements that generate data requirements. (Zielinski-IPA)
W81-01429

PRELIMINARY ANALYSIS OF HYDROPOWER PRODUCTION FEASIBILITY AT TWENTY-ONE EXISTING DAM SITES IN THE STATE OF MINNESOTA,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
J. Gulliver, R. J. Garver, R. E. A. Arndt, and C. E. Bowers.
Project Report No 196 prepared for State of Minnesota Energy Agency, August, 1980. 25 p, 5 Fig, 5 Tab, 9 Ref.

Descriptors: *Minnesota, *Hydroelectric plants, *Damsites, *Feasibility studies, Power head, Hydraulics, Hydrologic data, Discharge(Water), Inflow, Flow rates, Rehabilitation, Economic feasibility, Cost repayment, *Hydropower production feasibility.

A preliminary estimate of hydropower production feasibility was made for twenty-one existing dam sites in the State of Minnesota. The purpose of the preliminary analysis was to determine whether a comprehensive feasibility study is justified for the site. The expected annual energy production and initial project cost were estimated for each site. Initial cost estimates include turbine, generator, transmission line, and other electromechanical features as well as the civil features of hydropower retrofitting. Initial cost does not include dam rehabilitation, since the required information is not available for 19 of the 21 sites. The 'relative cost' of the project was defined as the initial cost divided by the annual energy production, and was calculated for each site. The relative cost and general curves for payback period were used to estimate hydropower feasibility at each site. The results of the preliminary analysis are: 5 sites have good or very good hydropower feasibility, 6 sites are marginal, and 10 sites have poor hydropower feasibility. Estimates of the cost of a comprehensive feasibility study are included for each site. (Author's abstract)
W81-01430

AN EVALUATION OF MICHIGAN'S WETLAND PROTECTION ACT AND RECOMMENDATIONS FOR ITS IMPLEMENTATION,
Great Lakes Basin Commission, Ann Arbor, MI.
For primary bibliographic entry see Field 6A.
W81-01435

MEASURING BENEFITS AND THE ECONOMIC VALUE OF WATER IN RECREATION ON HIGH COUNTRY RESERVOIRS,
Colorado State Univ., Fort Collins. Dept. of Economics.
R. G. Walsh, R. Aukerman, and R. Milton.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-161044, Price codes: A04 in paper copy, A01 in microfiche. Colorado Water Resources Research Institute, Colorado State University Competion Report No 102, September, 1980. 50 p, 5 Fig, 13 Tab, 46 Ref. OWRT-B-175-COLO(1), 14-34-0001-8068.

Descriptors: *Recreation demand, *Economics, Water demand, Recreation facilities, *Reservoirs, Public land, Social aspects, High mountain reservoirs, Public benefits, Evaluation, Front Range(CO), *Colorado.

This report analyzed the public benefits from expanding recreation opportunities at high mountain reservoirs located in the Front Range of Colorado. Until recently, more than 100 reservoirs with 3,500 surface acres were closed to public use, representing 40% of the total surface area of reservoirs at 6,000 to 11,000 feet elevation. A representative sample of 200 persons were interviewed at 14 study sites. Respondents reported willingness to pay contingent on changes in congestion and water level. Benefit functions were adjusted for the effects of crowding, reservoir water drawdown, characteristics of participants, type of recreation facilities present, and costs of management. Policy implications were discussed with emphasis on application of the information to water management decisions. Benefits from expanding recreation opportunities at high mountain reservoirs which until recently were closed, would accrue to all individuals who have access to high mountain reservoirs, because of the reduced congestion which would result at substitute sites. Providing access to one-third more undeveloped and semi-developed reservoirs would increase individual recreation benefits by an average of $3-$6 per user day. However, the same cannot be said for fully developed reservoirs, where expansion of recreation opportunites is not critical in the short run.
W81-01468

QUALITATIVE ASSESSMENT OF THE ECONOMIC IMPACTS OF A RISING WATER TABLE, LAS VEGAS, NEVADA,
Nevada Univ. System, Reno. Water Resources Center.
W. W. Woessner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-161051, Price codes: A03 in paper copy, A01 in microfiche. Publication No 41068, 1980. 24 p, 7 Fig, 2 Tab, 13 Ref, Append. OWRT-A-091-NEV(1), 14-34-0001-9030.

Descriptors: *Water table, *Groundwater management, *Groundwater movement, *Economic impact, *Irrigation effects, Water injury, Salinity, Infiltration, Lawns, Nevada, Las Vegas Valley(NV).

This effort was directed toward reviewing available information on the shallow groundwater reservoir in Las Vegas Valley and assessing the general

existing and potential economic consequences resulting from evidence of a rising shallow water table. The rising water table is principally a result of excessive lawn irrigation. Over 50% of the valley is within an area in which the water table is less than 50 feet below land surface. Groundwater infiltration and inflow to sewer lines which result in excessive high salinity water for treatment are the current and most immediate future economic impacts. Additional future impacts include recharge of poor quality water to the deeper water supply zone, water-logging of property causing landscaping and foundation damage, and increased groundwater discharge and salinity loading to the Colorado River system. Mitigation methods include reduction of over-irrigation of lawns by voluntary and regulatory methods.
W81-01469

DIFFERENTIALS IN AGENCY POWER: DETERMINING INNOVATIVE CAPABILITY IN WATER RESOURCES AGENCIES,
Arizona Univ., Tucson. Dept. of Political Science.
J. Nienaber.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-161069, Price codes: A06 in paper copy, A01 in microfiche. Completion Report, September 1980. 96 p, 4 Fig, 3 Tab, 43 Ref, 1 Append. OWRT-B-054-ARIZ(1), 14-34-0001-7138.

Descriptors: *Federal government, *Water resources development, *Institutional constraints, *Political constraints, *Creativity, Administrative agencies, Governmental interrelations, Political aspects, Research priorities, United States, Federal jurisdiction, Legal aspects, Institutions, Constraints, Administration, Water management(Administrative), Administrative decisions, Planning, History.

Various internal agency characteristics and external environmental variables were examined that influence the capacity of an agency to take on new responsibilities, obtain increased appropriations/personnel, and establish a predominance within the agency's area of operation. By carrying out a detailed historical analysis of seven Federal agencies (Bureau of Reclamation; Bureau of Land Management; Corps of Engineers; Fish and Wildlife Service; Forest Service; National Park Service; and Soil Conservation Service), six variables were isolated that impact on an agency's ability to innovate. Relative measures of agency appropriations, work force size and perceived status rankings were established through a cross-validation of the historical data, and an agency innovation model was developed. Using this approach, explanation of the strength of some agencies relative to other agencies was assessed. Federal perception of agency strength from interviews with middle/upper level officials of the seven agencies (ranking the other six agencies on four variables: relative power within Executive Branch; close relationship with Congress; Interest Group support; quality of response to NEPA), ranked the Corps of Engineers highest and the Forest Service, second. (Zielinski-IPA)
W81-01470

VULNERABILITY OF WATER SUPPLY SYSTEMS TO DROUGHTS,
Utah Water Research Lab., Logan.
D. S. Bowles, T. C. Hughes, W. R. James, D. T. Jensen, and F. W. Haws.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-163578, Price codes: A05 in paper copy, A01 in microfiche. Water Resources Planning Series UWRL/P-80/08, December, 1980. 67 p, 7 Fig, 13 Tab, 33 Ref. OWRT-A-042-UTAH(1), 14-34-0001-9047.

Descriptors: *Droughts, *Drought vulnerability, Stochastic processes, *Model studies, *Utah, Drought tolerance, Water supply, Irrigation, Municipal water, Drought effects, Salt Lake County(UT), Utah 1977 drought.

This summary completion report describes the project work completed in three areas: (1) the development and preliminary testing of drought severity and vulnerability indices, (2) the impacts of Utah's 1977 drought, and (3) an operation comparison of stochastic streamflow models. The drought indices were evaluated for three municipal and three irrigation water supply systems in Utah. It was concluded that a continuous loss function to define the effects of water shortage would be more appropriate than the existing assumption that drought-related losses occur suddenly at a certain degree of water shortage. Information on the impacts of Utah's 1977 drought was collected by surveys of municipal and rural domestic systems, water users in Salt Lake County, and farmers, stockmen, ranchers, and irrigation company officials. Survey results were used to examine drought effects in different regions of the state and with respect to size of municipal supply systems. Despite severe restrictions placed on Salt Lake county water users most did not consider the experience an 'undue burden'. The comparison of five stochastic streamflow models on four Utah streams lead to a preliminary model choice strategy which is based on the historical estimates of the lag-one autocorrelation and Hurst coefficients.
W81-01493

CHANGE: A MANAGEMENT PROBLEM OR A PROBLEM WITH MANAGEMENT,
Honolulu City and County Board of Water Supply, HI.
K. Hayashida.
Journal of the American Water Works Association, Vol 72, No 11, Part 1, p 612-613, November, 1980.

Descriptors: *Management, *Productivity, *Water works, Public utilities, Personnel management, Administration, Employee relations, Honolulu, Costs.

Management of water utilities must respond to changes in order to maintain productivity. Examples of implementing changes with minimum employee resistance are given from an experience in the Honolulu Board of Water Supply. Overtime was cut from $400,000 in 1974 to $256,000 in 1975 by transferring some tasks to other city departments and managing overtime requests more carefully. Staff cut-backs were made slowly through attrition and assigning certain jobs to outside contractors. Take-home cars for emergency transportation were reduced from 73 to 42, with immediate complaints from affected personnel but considerable savings to the utility. The department was decentralized from a vertical pyramid with 5 major divisions into 9 divisions with shorter lines of communication to the executive level. (Cassar-FRC)
W81-01549

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

PRELIMINARY ANALYSIS OF HYDROPOWER PRODUCTION FEASIBILITY AT TWENTY-ONE EXISTING DAM SITES IN THE STATE OF MINNESOTA,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
For primary bibliographic entry see Field 6B.
W81-01430

6D. Water Demand

TREATED WATER DEMAND AND THE ECONOMICS OF REGIONALIZATION: VOLUME 1. THE RESIDENTIAL DEMAND FOR TREATED WATER,
Alabama Univ., University.
B. P. Helms, and J. F. Vallery.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-145617, Price codes: A05 in paper copy, A01 in microfiche. Environmental Protection Agency Report EPA-600/2-80-162, August, 1980. 93 p, 5 Fig, 14 Tab, 22 Ref, 3 Append. R805617.

Descriptors: *Domestic water, *Water demand, *Water rates, *Economics, Water utilization, Lawns, Water conservation, Irrigation practices, Pricing, Income, Appliances.

The present and future demands and costs for residential water are examined in view of the new requirements for water quality standards under the Safe Drinking Water Act of 1974. The determinants of residential water demand, including water price, family income, and appliance ownership were investigated using data from two surveys of utility customers. A methodology was developed by which utilities can determine future customer demand. It was found that the number of persons in the home and family income are the most important determinants of water consumption. Price affects consumption, but much less than has been indicated in most previous studies. The presence of various water-using appliances affects the use of water, but this is generally a reflection of income, and therefore information on appliances may be redundant if accurate income data are available. The percent of customers irrigating increases with income, but heavy waterers are found scattered throughout the moderate-to-high income levels, and are in the minority at all income levels. Completely eliminating lawn irrigation cannot greatly curtail the need for new water supplies, since irrigation water accounts for only about 3.5% of total use. Significant water conservation is unlikely to be achieved through the use of rational rate increases. Future reductions in water demand will more than likely come from technological changes in the household water-consuming appliances. An increasing block rate structure may be feasible only in systems with computerized billing systems, and it would induce only limited conservation with relatively high, widely publicized rates. The primary advantage would be that the revenue would be collected from these primarily responsible for the peak load. (Moore-SRC)
W81-01442

BREAKING THE COST BARRIER TO HOUSEHOLD WATER SERVICE,
E. F. Lowry.
Journal of the American Water Works Association, Vol 72, No 12, p 672-677, December, 1980.

Descriptors: *Domestic water, *Cost analysis, Water costs, Water distribution(Applied), Construction costs, Water utilization, Potable water, Water demand, *Philippines.

The Barangay Water Program in the Philippines is used as an example of one way of providing economically feasible water systems connected to private households in rural, low income areas in developing nations. A key aspect of the success of this program has been the reduction of the per capita construction cost as much as possible. The Barangay Water Program under the Ministry of Local Government and Community Development set forth a technical manual covering design criteria that are to be used, determinations for size and locations of storage, selection of pipeline sizes, presentations of materials specifications, and prepartion cost estimates. This approach has allowed the program to proceed under sound economic designs. Much of the cost reduction seen in the program has resulted from the standardization of design criteria. Additional savings were realized through the use of standardized storage in a standpipe configuration instead of conventional elevated storage tanks. The choice of materials was the last factor which contributed to the cost reductions. The potential for consumption would indicate that the day begins with the equivalent of 5 cans of water (each can equalling a 5 gal kerosene can) in storage per home. The water enters the home at the rate of 23 liters (6 gal) per hour. Level 3A services such as this were in place in 8 diverse locations around the Philippines by May, 1980. In the future a water system is expected that will pipe water into rural areas at 450 liters (120 gal) per day in the home for less than $21 per capita construction cost. (Baker-FRC)
W81-01548

6E. Water Law and Institutions

EFFECTS OF WATER QUALITY ON FISH,

Purdue Univ., Lafayette, IN. Dept. of Forestry and Natural Resources.
For primary bibliographic entry see Field 5C.
W81-01504

NATIONAL MUNICIPAL POLICY AND STRATEGY: TIGHTENING THE SCREWS,
D. V. Feliciano.
Journal of the Water Pollution Control Federation, Vol 52, No 1, p 3-7, January, 1980. 1 Fig, 1 Tab.

Descriptors: *Water quality control, *Legislation, *Clean Water Act, National Municipal Policy and Strategy, Government supports, Permits, Water policy, EPA, Water institutions.

The National Municipal Policy and Strategy was signed by the EPA in 1979 and is viewed as a vehicle for dealing with the almost 60% noncompliance of some 17000 publicly owned treatment works (POTWs). These POTWs were failing to cooperate with the 1977 guidelines and treatment requirements that had been previously established. The municipal strategy will permit examination of those POTWs that are not in compliance with the standards set in 1977 and will determine whether they are eligible for extension of the deadline provided for under the Clean Water Act. Specific compliance schedules will be drawn where applicalbe. In cases where enforcement is necessary, the municipal strategy will coordinate this with the availability of construction grant funds and with reordered state priority lists. (Baker-FRC)
W81-01507

WATER QUALITY MANAGEMENT-HAVE WE LOST SIGHT OF THE OBJECTIVE,
Mathematical Sciences Northwest, Inc., Bellevue, WA. Consulting Div.
G. R. Minton.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol 106, No WR1, p 131-141, March, 1980. 50 Ref.

Descriptors: *Federal Water Pollution Control Act, *Water management, Planning, Water quality, Water pollution sources, Local government, Federal government, Water quality control, *Water pollution control, Pollution abatement, Federal government, Water resources development, Water policy, *Water quality standards.

After the passage of the Federal Water Pollution Control Act Amendments in 1972, the water pollution control strategy of the United States was criticized by the General Accounting Office, the business community, scientists and professional agencies, and the National Resources Defense Council. The general complaints have focused upon the strategy's attempts at control of effluents rather than concentrating on a long-term strategic approach to achieving better water quality. The need to put receiving-water considerations back into water management decisions is stressed. To deal successfully with nonpoint pollution sources, studies must be made on the seasonality of certain beneficial uses as well as on water quality. Effective parameters must be adopted in monitoring nonpoint pollution. The evaluation of the integrity of the biological community has been suggested as an indicator or receiving water reaction to nonpoint pollution sources, but such a system would require vast sums of money for research. Little data exists on the potential benefits of improved water quality, but this situation is expected to be remedied under the 1977 Amendments. Under a proposed plan for improved water quality management, emphasis is given to nonpoint pollution, the role of local governments, monitoring, the handling of policy conflicts, the use of incentives, new technical tools and natural resource management. The need for integration of environmental objectives in urban areas is also discussed. (Geiger-FRC)
W81-01510

MANAGEMENT OF US WATER RESEARCH,
North Carolina Water Resources Research Inst., Raleigh.
N. S. Grigg.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol 106, No WR1, p 143-158, March, 1980. 10 Fig, 19 Ref.

Descriptors: *Water management, *Water Resources Research Act, Water resources, Planning, Administrative agencies, Research and development, Federal government, State government, Water policy, Water quality, Water law.

The United States' organizations for managing water research exist at five levels: international, national, agency, organization and project levels. The international organizations include such groups as UNESCO, WHO, and WMO. No single main national organization exists for water research in the United States, and organizational level facilities may occur in academic, government-controlled or private-sector institutions. It is estimated that an evaluation of the effectiveness of these organizations would take a substantial effort. The technology adopted to manage the US water resources has been described as a function of the quality of life society wishes to attain. Water management involves budgetary decisions and energy and manufacturing considerations on an intergovernmental level. The contributions of utilities, industries and water associations have not been fully recognized when establishing water research fund allocations. Input from these sources has been recently taken into account under the National Science and Technology Policy, Organization, and Priorities Act of 1976. New and expanded programs will be needed at the federal level to serve state and local governments and coordinate the intergovernmental aspects of water resource managment. (Geiger-FRC)
W81-01512

BREAKING THE COST BARRIER TO HOUSEHOLD WATER SERVICE,
For primary bibliographic entry see Field 6D.
W81-01548

ECONOMIC DREAM OR ENVIRONMENTAL NIGHTMARE. THE LEGALITY OF THE 'BUBBLE CONCEPT' IN AIR AND WATER POLLUTION CONTROL.
Lewis and Clark Coll., Portland, OR. Natural Resources Law Inst.
J. L. Landau.
Boston College Environmental Affairs Law Review, Vol 8, No 4, p 741-781, 1980. 224 Ref.

Descriptors: *Water pollution control, *Bubble concept, *Environmental control, *Regulation, Air pollution, Legal aspects, Administrative agencies, Legislation, Water quality standards, Control, Clean Air Act, Legislation, Water Quality Act, Water policy, Water institutions, *Economics.

The 'bubble' concept or alternative emission reduction options policy is a reform proposed by the U.S. EPA to improve economic efficiency in its regulatory program. This concept offers industries an incentive to develop effective pollution control technology at the least cost. As an example, if an imaginary bubble were placed over a factory, the industry would be responsible for the total emissions, not emissions from individual pipes or stacks. The bubble concept is applied to water pollution control as well as to air pollution. The question is how to define 'point source', whether it can be considered an entire plant as opposed to individual pipes and processes. Much debate on the merits and disadvantages of the water pollution bubble system had taken place within the government, and the status of such a policy remains indefinite. Some of the objections are increased need for regulatory personnel, development of bargaining between agencies and industries, threats of environmental degradation, difficulty of verification, and mistrust of industries to comply in good faith. Rebuttals to these statements respectively cite great cost savings for industry and indirectly for the consumer, present and past use of negotiations, no change in character or quantity of discharges, and noncompliance by some businesses no matter what the system. (Cassar-FRC)
W81-01605

6F. Nonstructural Alternatives

WATER QUALITY AND WESTERN ENERGY - WHAT ARE THE TRADE-OFFS,
J. T. Dale.
Journal of the Water Pollution Control Federation, Vol 52, No 1, p 8-14, January, 1980. 1 Fig, 3 Tab.

Descriptors: *Water quality control, *Resources development, *Energy, Runoff, Salinity, Land management, River basin development, Water resources planning, Colorado River, Mexican Water Treaty.

The development of potential sources of energy in the western states of Montana, North Dakota, South Dakota, Wyoming, Colorado, Utah, Arizona, and New Mexico, and the impact of such development on the quality of water in the Colorado River are discussed. Both the Upper Colorado and the Upper Missouri river basins will be affected, but the former will suffer the most from the development. The water of the Colorado is already overobligated, according to some experts, and is creating a water deficiency/water quality problem in violation of a treaty with Mexico. Increased demands will only hurt the situation. Major efforts will have to be made to prevent increases in stream salinity resulting from concentration effects. Choices include better control of point sources, better control of non-point sources, or treating surface water through desalination plants. With energy development in this area, population increases are also expected, with added municipal effluent effects on the water quality. Various suggestions for improving water quality include control procedures, improved design of holding ponds, pretreatment of effluents prior to pond discharge, selection of energy conversion facilities in locations which minimize water quality problems, secondary and tertiary waste water treatment, land applications of municipal waste water, reduction of runoff from energy facilities, and reduction of runoff from agricultural lands. (Baker-FRC)
W81-01506

6G. Ecologic Impact Of Water Development

ECOLOGICAL ASPECTS OF LAKE NASSERNUBIA,
For primary bibliographic entry see Field 2H.
W81-01564

THE WATER BUDGET OF LAKE QARUN AND ITS PHYSICO-CHEMICAL CHARACTERISTICS,
Economics, Statistics, and Cooperatives Services, Broomall, PA.
For primary bibliographic entry see Field 2H.
W81-01565

SOME ENVIRONMENTAL ISSUES IN WATER FOR DEVELOPMENT,
United Nations Environmental Programme, Nairobi (Kenya).
L. E. Obeng.
Water Supply and Management, Vol 4, No 3, p 115-128, 1980. 2 Fig, 2 Tab.

Descriptors: *Regional development, Regional economics, Water management(Applied), Water distribution(Applied), *Water supply development, Water resources development, *Environmental effects, Developing countries, Ecosystems.

The major environmental issues in water use for development are the availability of adequate water, water quality, the significance of water in productive ecosystems, and the efficient management of water resources. Proper resources management may include the establishment of an institutional structure to support information gathering and dissemination. Management problems are shared by most countries. Generally, manpower, equipment, and money are not sufficient for proper management. The most basic problems nations may face are the lack of sufficient water or the poor quality

of the water that is available. While water treatment and waste and sewage treatment are important, they are expensive and often beyond the means of a developing nation. The effects of necessary dams and irrigation must be considered. Water management is necessary for the improvement of life, food, shelter, clothing, and health of developing nations. (Small-FRC)
W81-01566

PHYSICO-CHEMICAL CONDITIONS, FAUNA AND FLORA OF LAKE MANZALA, EGYPT,
Alexandria Inst. of Oceanography and Fisheries (Egypt).
For primary bibliographic entry see Field 2H.
W81-01567

STUDIES ON THE CHANGES OF SOME ECOLOGICAL FACTORS AFFECTING FISH LIFE IN LAKE QARUN, FAIYUM, EGYPT,
Faculty of Science, Sohag (Egypt). Dept. of Zoology.
For primary bibliographic entry see Field 2H.
W81-01568

THE ENVIRONMENTAL DIMENSION IN WATER MANAGEMENT; THE CASE OF THE DAM AT SALTO GRANDE,
Bariloche Funscion, San Carlos de Bariloche (Argentina).
G. Gallopin, T. R. Lee, and M. Nelson.
Water Supply and Management, Vol 4, No 4, p 221-241, 1980. 5 Fig, 4 Tab, 6 Ref.

Descriptors: *Water management, *Model studies, *Dams, Water resources development, Ecosystems, Future planning, Social aspects, Water quality, Environmental effects, Economics, International commissions, Quality control, Dam construction, *Uruguay River, *Argentina, *Uruguay.

A bi-national Technical Commission (CTM) was formed to handle the project of construction of a dam at Salto Grande on the Uruguay River. CTM initiate numerous study programs to develop regulatory and management criteria to maintain environmental quality in the area that the dam would affect, which included land from the nations of Uruguay and Argentina. A workshop attended by CTM members defined the system to be controlled and gave as the main objective of the system the maintenance of the quality of life. This system was subdivided, yielding an economic and socio-cultural subsystem which was in direct interaction with a physical subsystem to maintain the integrity of air, water, soils, and terrestrial and aquatic biota. To gather information as quickly as possible and enhance inter-disciplinary communications, a questionnaire approach was adopted. The questionnaire focused on indicators of the state of each sector and attempted to highlight significant associations that might exist between sectors. A second workshop compiled data from the questionnaire and generated flow diagrams for each sector, showing interactions between systems. A final CTM workshop clarified actions which impacted on the water sector, the soil and terrestrial flora and fauna sector, the socio-economic sector, and actions which had chain effects through several systems. It was concluded that the model offered a viable organizational framework for coordinating research on an array of natural and social sciences. (Geiger-FRC)
W81-01572

7. RESOURCES DATA

7A. Network Design

SAMPLING: DEFINING THE TASK AND PLANNING THE SCHEME,
Water Research Centre, Marlow (England). Medmenham Lab.
J. C. Ellis, and R. F. Lacey.
Water Pollution Control, Vol 79, No 4, p 452-467, November, 1980. 8 Fig, 1 Tab, 4 Ref.

Descriptors: *Statistical methods, *Sampling, *Streams, Water sampling, Streamflow, Effluent streams, Influent streams, Project planning, Methodology.

Applying statistical planning increases the effectiveness of stream sampling, which includes rivers, streams, effluents, and influents. The paper emphasizes how the program design is influenced by the objective, the degree of tolerable imprecision, assumptions concerning variability in the system, and available resources. A clear objective is necessary to gather the proper amount of relevant information. Some possible objectives are as follows: to spot abnormal concentrations, to define peaks, to gather general information, to estimate mean concentration, to detect changes, to monitor processes, to determine a fair industrial effluent charge, to estimate a percentile, and to monitor for compliance. Specific instructions, as well as examples of applying the statistical method, are given for each of these objectives. (Cassar-FRC)
W81-01627

7B. Data Acquisition

DETECTION OF WATER QUALITY CHANGES THROUGH OPTIMAL TESTS AND RELIABILITY OF TESTS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
R. W. Koch, T. G. Sanders, and H. J. Morel-Seytoux.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-161028, Price codes : A07 in paper copy, A01 in microfiche. Colorado Water Resources Research Institute, Colorado State University, Completion Report No 104, September, 1980. 123 p, 28 Fig, 21 Tab, 12 Ref, 5 Append. OWRT-B-186-COLO(2), 14-34-0001-8069.

Descriptors: *Water quality changes, Water quality monitoring, *Mathematical models, Water quality management, Hydrologic data, Simulation analysis, Statistical methods, Correlation analysis, Evaluation, *Time series analysis.

The detection of change in a hydrologic variable, particularly in water quality, is a current problem. A method of formulating this problem in a mathematical programming context is presented. The method is based on using weighted linear combinations of water quality variables from different locations with the weighting factors being adjusted so that the time required to detect the change is minimized. The basis of the technique, then, is a trade-off of time by adding information from other locations. The results of example applications show that significant savings in time can be achieved by using this method. Since the detection method is based on sample statistics developed from historic data, uncertainty exists as to how accurately the optimal values of the time required to detect the change and the weighting factors reflect the true, but unknown, values. A method of evaluating the reliability of these estimates is presented using an analytical solution of the optimization problem. Through this approach, expressions are obtained relating explicitly the optimization variables to the random variables of the problem, giving a clear picture of the interrelationships. Simulation is then used to evaluate the behavior of the optimization variables through these explicit relations.
W81-01466

ANALYSIS OF DIGITIZED M-33 RADAR DATA FROM TEXAS HIPLEX, 1976-1978,
North American Weather Consultants, Salt Lake City, UT.
For primary bibliographic entry see Field 3B.
W81-01480

A REMOTE SENSING TECHNIQUE TO MONITOR CLADOPHORA IN THE GREAT LAKES,
Environmental Research Inst. of Michigan, Ann Arbor.
F. J. Tanis.
Environmental Protection Agency Report EPA-600/3-80-075, July, 1980. 36 p, 12 Fig, 4 Ref. R803611.

Descriptors: *Great Lakes, *Cladophora, *Remote sensing, *Eutrophication, Lake Ontario, Algae, Nuisance algae, Aquatic plants, Biomass, Analytical techniques, Distribution, Water pollution, Standing crops, Monitoring, Mapping, *Aerial photography, Multispectral scanner.

The presence of the nuisance alga Cladophora along parts of the Great Lakes shoreline is one of the negative consequences of excess inputs of pollutants into the Lakes and their contributing rivers and streams. An airborne multispectral scanner was used to monitor Cladophora at two sites on the Lake Ontario shoreline near Rochester, New York. Computer generated color maps were produced to show spatial distribution of Cladophora in the nearshore zone and to estimate standing crop. Recognition of Cladophora biomass from aircraft imagery requires gathering Cladophora samples at known locations. Sampling locations can be marked with highly reflective floats which are visible in the multispectral imagery. The use of multispectral digital instrumentation allows development of automatic recognition techniques. Results can be displayed as high resolution maps for selected areas and to compile standing crop estimates over large reaches of shoreline. Specific influences of local sources of nutrients of various environmental contaminants on the growth and extent of Cladophora should be monitored using this aerial technique with multiyear surveys. Improvements in local water quality as a result of implementation of remedial programs can be expected to affect Cladophora growth and therefore are observable in the airborne surveys. (Moore-SRC)
W81-01486

RECOMMENDATIONS FOR USE OF SI UNTS IN HYDRAULICS,
M. S. Petersen.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 106, No HY12, p 1981-1994, December, 1980. 11 Tab, 8 Ref.

Descriptors: *Construction, *Standards, *Measurement, Technical societies, Metric system, International System of Units, Hydraulics, Hydraulic engineering, *International system of units(SI).

Basic information is presented on the International System of Units (SI), including recommended units, in a suitable form for hydraulic engineers. The following are included: a table for conversion to SI units of physical quantities frequently used in water resources practice, such as acceleration, energy/area-time, force, and heat; and tables of equivalent units for length, area, volume, flow rate, velocity, mass, force, and physical properties. The information presented is the result of meetings and questionnaires from the ASCE Committee on Metrication. While changeover to the use of SI is voluntary, the changeover is to start in the construction industry on January 1, 1981. By January 1, 1985, most of the construction industry will work in the metric system. (Small-FRC)
W81-01520

CO-ORDINATION OF MODELS IN SOFTWARE SYSTEMS FOR LARGE SCALE WATER RESOURCES PROJECTS,
Soyuzgiprovodkhoz, Moscow (USSR).
For primary bibliographic entry see Field 6A.
W81-01573

A DESIGN FOR A SIMPLE UNDERWATER IRRADIANCE METER,
Liverpool Univ., Port Erin (England). Dept. of Marine Biology.
T. H. Moller, and H. Bailey.
Estuarine and Coastal Marine Science, Vol 11, No 3, p 347-352, September, 1980. 5 Fig, 9 Ref.

Descriptors: *Instrumentation, *Light intensity, *Irradiation, Performance, *Aquatic animals, Aquatic environment, Calibrations, Measurement,

Light attenuation, Light penetration, Extinction coefficient.

The assembly, calibration, and performance of an irradiance meter intended for underwater measurements in a single waveband are described. The meter utilizes seven Clairex cadmium sulfide photoconductive sensors and a Field Effect Transistor Volt Ohm Meter to measure changes in resistance of the coupled photoconductors. Calibration follows the method of Jones (1970) and Arnold (1975). A calibration curve was constructed by placing a succession of neutral density filters in a known light path. The irradiance meter is simple to deploy and operate even from small vessels. Since the meter is independent of an external power source, a diver can take in situ irradiance readings. At depths of 70 m, 60 seconds are required to obtain a constant reading. Ten to the minus 7th watts per square meter represents the minimum irradiance level which is accurately detected by the meter, but the response time of about five minutes for values below ten to the minus 6th watts per square meter may in some cases be impractical. Instrument performance is discussed in relation to angular light response, immersion effect, response time, temperature dependence, and filter band width error. (Small-FRC)
W81-01587

8. ENGINEERING WORKS

8A. Structures

APPARATUS FOR PROTECTING AQUATIC LIFE PASSING THROUGH A WATER FILTER,
Passavant Corp., Birmingham, AL. (Assignee).
R. McCawley, and K. R. Siddle.
U.S. Patent No 4, 199,453, 7 p, 5 Fig, 8 Ref; Official Gazette of the United States Patent Office, Vol 993, No 4, p 1373, April 22, 1980.

Descriptors: *Patents, *Intakes, *Powerplants, *Aquatic life, Filters, Entrainment, Engineering structures, Impingement.

An apparatus for protecting aquatic life carried by water passing through a vertical traveling band screen unit has inwardly opening screening baskets. Each basket carries a longitudinally extending, inwardly projecting baffle adjacent its trailing side with the portion adjacent the basket being imperforate. The area along the length of each basket at the inner side of the baffle is imperforate and defines with the baffle a pocket for receiving water and aquatic life carried upon upward movement through the water. It is adapted to discharge the water and aquatic life upon movement of the pocket to a predetermined elevation. A low pressure stream of water transfers the aquatic life from the pocket to a discharge trough located inwardly of the screening unit. (Sinha-OEIS)
W81-01444

RELIABILITY OF DAMS SUBJECTED TO HYDRODYNAMIC FORCES DURING EARTHQUAKES,
Delaware Univ., Newark. Dept. of Civil Engineering.
V. Chiarito.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-163594, Price codes: A06 in paper copy, A01 in microfiche. MS Thesis, June, 1981. 97 p, 20 Fig, 18 Tab, 18 Ref, 5 Append. OWRT-A-047-DEL(3), 14-34-0001-0108.

Descriptors: *Design criteria, *Dams, *Reservoirs, Earthquakes, *Hydrodynamics, Structural geology, Engineering structures, Equations, Random hydrodynamic force, Delaware, Hoopes Dam(DE).

The assumptions and formulation of the governing wave equation are presented for the dam-reservoir system. The equations for the random hydrodynamic force and moment response are derived in a nondimensional form. Using random vibrations theory reliability functions are formulated for stability criteria concerning sliding and overturning. An application of the final results to Hoopes Dam in Delaware is presented. In this thesis the safety of the dam-reservoir system is analyzed by a probabilistic approach. Other works are cited; and nonstationary models used for the acceleration and response force are explained. The equations involve integrals with no known analytic solution. Thus, the integrals need to be evaluated numerically. All the numerical results are presented and discussed. Comparisons to approximate solutions are made to determine the validity of the numerical results. Finally, extensions from this study for future research are noted.
W81-01495

UPGRADING THE OLD WHILE BUILDING THE NEW,
Inca, Ltda, Cali (Colombia).
For primary bibliographic entry see Field 5F.
W81-01547

PLANNING A 2300-FOOT TOTAL DYNAMIC HEAD WATER SYSTEM,
Wiley and Wilson, Inc., Lynchburg, VA.
W. S. Shenk.
Public Works, Vol 111, No 4, p 84-87, April, 1980. 2 Fig.

Descriptors: *Pipelines, Pumping, *Distribution systems, Water demand, Seasonal, Planning, Water management, *Recreation facilities, Water utilization, *Design criteria, *Appalachian Mountain region(VA), Virginia, Golf courses, Water hammer, Water supply.

The engineering of a water supply system for the Wintergreen Ski Resort atop the Appalachian Mountains of Virginia is described. The 2,150 feet of static lift from Lake Monocan, the nearest possible water source, to the mountain storage tank is spread over distinctly different mountain and valley segments. Maximum continuous demands over the winter may reach 1,400 gpm or 2 mgd. Several high pressure pump systems were evaluated in the design stage, and the system chosen for use involved a Lake Monocan pump station, a valley pipeline (17,000 feet), Peggy's Pinch pump station, a mountain pipeline (7,650 feet), and a mountain storage tank (250,000 gallons). The lake pumping station may be relocated if the lake is enlarged. The Peggy's Pinch station has two 700-gpm pumps with controls and welded steel piping that conforms to standards required in petroleum transport. To account for pressure rise due to instantaneous closures (water hammer) several surge protection devices were installed with automatic check valves. Spherical shock traps which were designed for data based on computer simulations of the worst possible water hammer situtation were also installed. Selection of pressure piping based on the hoop stress formula resulted in the use of ASTM A53 or API 5L, Grade B pipe with a yield strength of 35,000 psi. The mountain top reservoir serves the snow making machinery and golf course irrigation system and supplements domestic use when demand exceeds capacity of existing wells. The system has been operating since the 1974-75 ski season with essentially zero down time. (Geiger-FRC)
W81-01633

RETENTION BASINS: KEY TO STORM DRAINAGE PLAN,
Barrett, Harris, and Associates, Inc., Menlo Park, CA.
F. H. Barrett, Jr., and A. Petrie.
Public Works, Vol 111, No 3, p 67-70, March, 1980. 2 Fig, 2 Tab.

Descriptors: *Retention, *Storm runoff, *Basins, *Water storage, Urban drainage, Storm drains, Planning, Water management, California, Watersheds, Recreation, Project feasibility, Economics, Design criteria, Flood control, *Manteca(CA).

Reevaluation of the Manteca, California storm drainage fee structure in 1974 revealed that surface runoff discharge facilities were inadequate to handle storm conditions. Of the options available to correct the situation, the most practical in terms of costs and legal considerations was the construction of a system of retention basins. Design criteria were based on occurrence of an intense storm every 5 years, and peak unit flow calculations were estimated from land use, tributary area and total peak flows. Retention basins applicable to the study area which were examined included those with total gravity flow, those requiring pumping at inlet only, and those necessitating pumping only at the outlet. Different variables are considered which would influence the design of a basin. The drainage facility may be used for recreation nearly 80% of the time in most areas in California; safety and maintenance factors accompanying this dual use are discussed. A non-pumping drainage plan is usually favored. Since the original master drainage plan was completed in 1974, Manteca has completed 3 successful retention basins. Percolation basins may be feasible for recharging groundwater supplies in other areas where the water table is lower. Financial aspects of the storm drainage master plan were reviewed from the viewpoint of the residents, developers, and cities planning and managing committees. (Geiger-FRC)
W81-01637

DEFLECTION MECHANISM OF PVC SEWER PIPE,
Uni-Bell Plastic Pipe Association, Dallas, TX.
W. D. Nesbeitt, and R. T. Walker.
Public Works, Vol 111, No 3, p 79-83, March, 1980. 5 Fig.

Descriptors: *Flexibility, *Plastic pipes, Defection, Sewers, Piping systems, Pipes, *Pipelines, Engineering structures, Soil mechanics, Rigid foundations, Flexible foundations.

The deflection mechanism and uses of flexible polyvinyl chloride (PVC) sewer pipes are discussed. The engineering profession has long recognized the good long-term performance of PVC buried pipe. As flexible pipe defects, the vertical force vectors derived from the load (soil weight, superimposed dead load or superimposed live load) are distributed effectively through the defection mechanism into the surrounding embedment soil. The effects of soil arching and negative soil arching are outlined for both rigid and flexible pipes. For flexible pipes, the Marston formulas for calculating loads imposed on buried pipes are valid for narrow trench conditions. Research on the relationship between contact pressure and pipe flexibility has shown that the effective force vector distribution can provide substantial benefits when pipes of sufficient flexibility are premitted to deflect under load. The critical performance limits for different flexible pipe products have been defined in terms of their percent deflection. PVC sewer pipe (ASTM D 3034 DR 35) will not fail at a deflection equal to or less than 30% with a safety limit of 7.5%. Satisfactory operations of PVC pipe have been recorded for North American and some sites in Europe. Trial ASTM D 3034 DR 35 pipelines installed in the difficult soil conditions of the Netherlands are providing good long-term structural strength. (Geiger-FRC)
W81-01639

AUSTIN'S INTERCEPTOR AND TREATMENT PLANT: ENGINEERING WONDER,
Water and Waste Water Dept., Austin, TX.
C. E. Johnson.
Public Works, Vol 111, No 4, p 69-73, April, 1980. 1 Fig.

Descriptors: *Sewage treatment, Tunnels, *Waste water treatment, *Treatment facilities, Discharge lines, *Austin(TX), Texas, Colorado River, *Design criteria, Urban development, Filtration, Odor, Sludge treatment, Industrial wastes, Costs, Instrumentation, Grants.

The interceptor tunnel of Austin, Texas and its main treatment facility, the Govalle plant, are described. The tunnel, which was designed to service population expansion into the northwest and east sectors of the city, was completed in 1975, and its discharge facility, the Walnut Creek treatment plant, in 1977. The tunnel operates by gravity flow and is 11 miles long with a 7-8 foot diameter. A

backwashing system was installed to assure a flushing velocity in the tunnel. Air louvers were provided at the inlets to control odors and keep the entire system aerobic. Metering devices allow diversion of flows to either the Govalle or Walnut Creek plant to evenly distribute treatment loads. Equalization basins double as primary clarifiers to give storm flows (up to 76 mgd) at least primary treatment and chlorination. Austin has placed limitations on all industrial and some municipal discharges into the sewer system. The waste water treatment plant was designed to be aesthetically pleasing to nearby residents. The treatment cycle now includes screening, grit removal, primary settling, flow equalization, activated sludge treatment, chlorination, and effluent filtration. Effluent filtration is accomplished by dual media gravity filters. Sludge is thickened at the Walnut Creek site and pumped to lagoons on the Colorado River seven miles away. Air filtration is carried out with granulated carbon absorbers to control odors. Delays in planning and construction occurred due to transitions in Federal grant programs. The costs for the interceptor tunnel and new treatment plant were $21 and $35.2 million, respectively. (Geiger-FRC)
W81-01641

8B. Hydraulics

MEASUREMENTS IN MERGING FLOW,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
W. H. C. Maxwell, and A. Snorrason.
Available from the National Technical Information Service, Springfield, VA 22161 as PB81-163545, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Center, University of Illinois, Research Report No 155, January, 1981. 38 p, 17 Fig, 2 Tab, 44 Ref. OWRT-A-103-ILL(1), 14-34-0001-0115.

Descriptors: *Diffusion-flow, *Flow characteristics, *Flow profiles, *Fluid mechanics, Jets, Mixing, Velocity, Turbulent flow, Testing procedures, Submerged turbulent jets, Merging flow, Reverse flow.

Previous measurements of the velocity field in the vicinity of two intersecting submerged turbulent jets provided evidence that, contrary to the usual assumptions, intersecting flows may not necessarily be combined using vector addition of velocities or momentum flux densities. To gather additional experimental evidence on the details of the velocity field near the intersection of two submerged turbulent jets, this study measured time average velocity magnitudes and directions of two perpendicular intersecting axisymetric submerged turbulent incompressible air jets of approximately equal strength. Because of the need to detect reverse flows, a three-dimensional pilot-type probe was used. This could sense yaw and pitch angles as well as velocity magnitudes. Two sets of measurements were taken. The more detailed set was confined to the plane of the nozzles, the less detailed set obtained cross-sectional data at four stations, three of these being in the observed reverse flow. The data show that the reverse flow spreads much more rapidly perpendicular to the nozzle plane than in the nozzle plane, whereas the forward flow is fairly symmetric. Similarity profiles were found in both the forward and reverse flows. In the forward flow the distribution was essentially Gaussian. This was also true in the backward flow in the direction normal to the plane of the nozzles. In the plane of the nozzles the backward flow profiles were close to semi-elliptical or semi-circular, depending on the scales for plotting.
W81-01490

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For primary bibliographic entry see Field 7B.
W81-01520

8D. Soil Mechanics

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Russell and Axon, St. Louis, MO.
For primary bibliographic entry see Field 4C.
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